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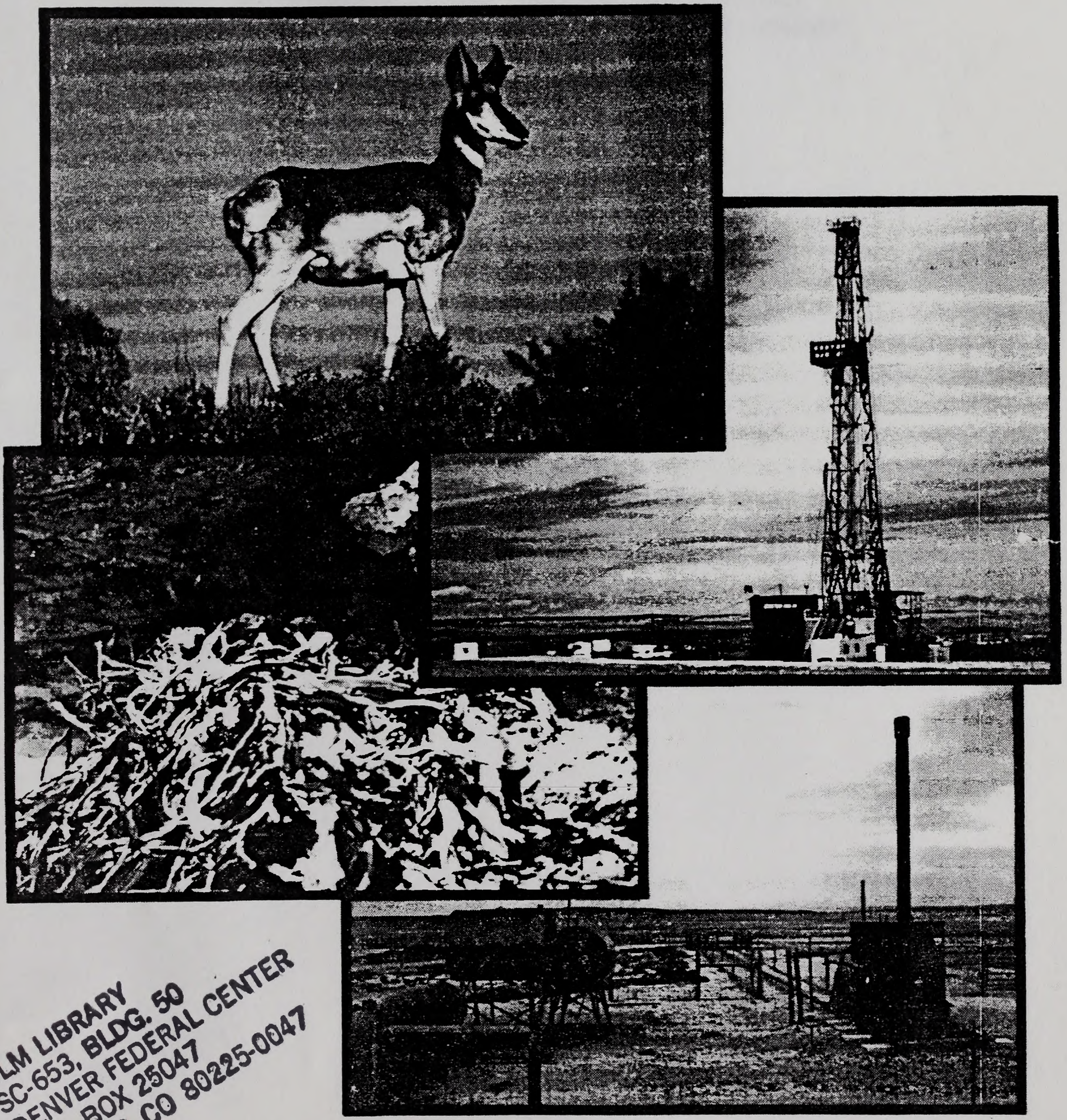
Rawlins District Office/Great Divide Resource Area

May 1994

Draft
Creston/Blue Gap Natural Gas Project Environmental Impact Statement



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DRAFT ENVIRONMENTAL IMPACT STATEMENT
CRESTON/BLUE GAP NATURAL GAS PROJECT
CARBON AND SWEETWATER COUNTIES, WYOMING

Prepared for

Great Divide Resource Area
Rawlins District
Bureau of Land Management
Rawlins, Wyoming

By

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Laramie, Wyoming
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May 1994

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DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE CRESTON/BLUE GAP NATURAL GAS PROJECT CARBON AND SWEETWATER COUNTIES, WYOMING

(X) Draft ( ) Final

U.S. Department of the Interior
Bureau of Land Management

Abstract:

This Draft Environmental Impact Statement assesses the environmental consequences of a proposed natural gas development project in southwestern Carbon and southeastern Sweetwater Counties, approximately 35 mi southwest of Rawlins, Wyoming. Public scoping commenced in late September and early October 1993. All issues raised during scoping and interdisciplinary team preparation of the analysis are addressed. The proposed project entails the drilling, completion, testing, operation, abandonment, and reclamation of a natural gas production operation by Snyder Oil Corporation, Amoco Production Company, Union Pacific Resources Company, Ensign Oil & Gas New Mexico, Inc., and other operators. The proposed project would use standard procedures as currently employed by other state and regional gas field developments. A maximum of 330 wells and associated ancillary facilities, roads, and pipelines would result in the initial disturbance of approximately 878 to 1,496 acres on and adjacent to the 207,746-acre project area. Numerous standard, project-specific, and site-specific mitigation measures would be employed to assure that project impacts are minimized on all important resources. Impacts to most resources would be negligible to moderate during the life-of-project. Potentially significant impacts resulting from the project include the reactivation of sand dunes and changes to visual resources. The proposed project could also have numerous beneficial impacts including increased revenues generated by taxes, royalties, and the use of local goods and services.

EIS Contact:

Comments on this EIS should be directed to:

Area Manager
Great Divide Resource Area
Bureau of Land Management
P.O. Box 670
Rawlins, Wyoming 82301

For further information contact Bob Tigner at the Rawlins District Office (phone [307] 324-7171).

Date Draft EIS Made Available to EPA and the Public: May 20, 1994

Date Comments on the Draft EIS must be received to be considered in the Final EIS: July 19, 1994

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:
1793 (934)

MAY 10 1994

Dear Reader:

This Draft Environmental Impact Statement (DEIS) is prepared pursuant to 40 CFR 1500-1508, for the Creston/Blue Gap Natural Gas Project in Carbon and Sweetwater Counties in Wyoming. The DEIS is provided for your review and comment and the Final Environmental Impact Statement (FEIS) will be based on comments received on this draft. Please keep this copy of the draft EIS for future use in your review of the final EIS.

The public comment period for this DEIS will close 60 days after the Environmental Protection Agency publishes their Notice of Availability of the DEIS in the Federal Register. When making written comments, please be as specific as possible and identify the chapter, page, and paragraph to which the comments pertain. The purpose of the review and comment period is to provide you an opportunity to participate in the environmental analysis process and the ultimate decisions reached.

A public meeting is currently scheduled for the Creston/Blue Gap Natural Gas Project DEIS at the Great Divide Resource Area Office, 812 E. Murray, Rawlins, Wyoming, on Wednesday, June 16, 1994, at 7:00 p.m. Should a change in scheduling occur, you will be notified.

Please address comments on this draft EIS or requests for additional copies of the draft EIS to:

Bureau of Land Management
Rawlins District Office
P.O. Box 670
Rawlins, Wyoming 82301
Attn: Dr. Bob Tigner

Sincerely,

Robert A. Bennett

Robert A. Bennett
State Director
ACTING

EXECUTIVE SUMMARY

This Draft Environmental Impact Statement was prepared in accordance with the National Environmental Policy Act of 1969 to assess the environmental consequences of a proposed natural gas exploration, development, and production operation in the Creston/Blue Gap Area of southwestern Carbon and southeastern Sweetwater Counties, Wyoming. Public scoping was conducted with scoping statements mailed to potentially interested parties and the media in late September and early October 1993. All issues identified during scoping and by a Bureau of Land Management Interdisciplinary Team review are addressed. The proposed project is in conformance with the BLM Great Divide Resource Area Resource Management Plan, the State of Wyoming Land Use Plan, the Carbon County Land Use Inventory, and the Sweetwater County Land Use Plan.

The proposed project is to explore for and develop natural gas and oil reserves present in the Mesaverde Group at depths of approximately 8,500 ft in the Creston/Blue Gap Area. The project area encompasses approximately 207,746 acres (144,497 federal, 54,463 private, and 8,786 state) within portions of Townships 14 through 19 North, Ranges 91 through 94 West.

The proposed project involves drilling and development of 200 to 330 natural gas wells primarily on 160-acre spacing patterns within and adjacent to existing natural gas units present on the project area. Standard procedures as currently used in gas field developments throughout Wyoming and the surrounding region would be employed during project development. Activities conducted during project development, operation, and abandonment would comply with all applicable federal, state, and county laws, regulations, and stipulations. Gas from the project would be transported through existing and newly developed pipelines linking the Creston/Blue Gap Area with existing interstate pipelines north of the project area.

The proposed project would initially disturb from 878 to 1,496 acres from well locations (438 to 750 acres), pipelines (245 to 418 acres), roads (187 to 320 acres) and ancillary facilities (8 acres). Approximately 4,304 acres of existing disturbance from 239 well locations, 536 mi of road, 207 mi of pipeline, and numerous ancillary facilities (31 acres) is present on the area.

It is anticipated that full field development would require several years, with approximately 55 to 110 wells being drilled per year between 1994 and 1997. The proposed drilling schedule would require a maximum of 9 drill rigs during the peak drilling season. Each drill rig would be operated on a 24-hour basis and require 3 crews of 5 people. As many as 30 workers may be at a rig site for short periods to conduct specific tasks such as fracturing. It would take approximately 20 days to drill each well. Production operations would require approximately 10 to 15 people for the life-of-project, which is anticipated to be approximately 30 to 50 years. Areas disturbed during drilling and initial construction that are not required for production (e.g., portions of well locations, pipeline rights-of-way, roads to unproductive wells, etc.) would be reclaimed as soon as practical. When gas reserves have been depleted, wells would be plugged and abandoned, using procedures designed to protect subsurface aquifers. Also, surface facilities (e.g., compressor stations, fluid storage tanks) would be removed, pipelines purged and abandoned in place, roads closed per landowner or BLM request, and disturbed areas reclaimed.

Three project development alternatives and the no action alternative are considered in this Environmental Impact Statement. Additional alternatives requiring alternate well numbers and densities were considered but rejected for environmental and/or economic reasons.

The Creston/Blue Gap Area is a continental, semi-arid, cold desert that lies within portions of the Washakie and Great Divide Basins, and the area has both relatively flat and rolling terrain broken by rugged badlands and rims. Intermittent and ephemeral drainages flow north to the Great Divide Basin or into the perennial Muddy Creek, which bisects the area, from north to south. Groundwater and surface water are variable in quality, and the major current use is for livestock.

Project area soils have high rates of natural erosion, and plant cover values and productivity are variable. Vegetation is primarily a grassland/shrubland mosaic comprised of big sagebrush, upland grasses, saltbush, and greasewood scattered with barren areas associated with cliffs, badlands, and rock outcrops. Range condition is generally good. Wetlands in the project area are restricted to drainage bottoms, around impoundments, and adjacent to Muddy Creek.

Pronghorn antelope and mule deer are the big game species most commonly occurring on the area, and crucial winter range is present for both species. Sage grouse leks and raptor concentration areas occur in and adjacent to the project area, and monitoring would be conducted to determine the activity status of sage grouse leks and raptor nests proximal to the proposed development. Threatened and endangered species that may occur on the area include black-footed ferret, bald eagle, and peregrine falcon. The mountain plover, a Category 1 species for threatened and endangered listing, potentially occurs in the area.

Livestock grazing, wildlife habitat, and oil and gas development are the predominant land uses in the project area. Although no active coal or uranium mines occur on the area, one active gravel quarry is present. No developed recreation sites occur on the area; however, dispersed recreational activities such as big game hunting do occur. These activities may be somewhat limited by existing oil and gas production facilities present throughout the area. Approximately 55% of the project area is Visual Resource Management Class IV, and the remainder is Class III.

Communities closest to the project area are Baggs (7 mi south), Wamsutter (23 mi northwest) and Rawlins (35 mi northeast). Access to the project area is from Interstate Highway 80 to Creston and south along State Highway 789, which bisects the area from north to south.

Numerous standard, project-specific, and site-specific mitigation measures would be employed during all phases of the project to assure that potential impacts are minimized. For example, disturbance of sensitive areas (e.g., steep slopes, raptor nesting areas, crucial winter range) would be avoided as much as possible, and activities would be authorized only during appropriate seasons. Surveys and subsequent monitoring would be conducted for cultural resources, paleontological resources, raptor nests, and sage grouse leks to document their status relative to specific disturbance activities. Reclamation would be conducted as soon as practical on areas disturbed during initial construction and drilling that are not required for production operations. Upon completion of the project, all wells would be plugged and abandoned, surface facilities would be removed, and most disturbed areas would be reclaimed and revegetated.

Project impacts to topography, mineable mineral resources, paleontology, land slides, floodplains, water resources, vegetation, wetlands, socioeconomics, transportation, livestock grazing, and cultural resources are expected to be negligible. Moderate impacts to air quality, soils, noise, wildlife, recreation, and visual resources are expected due to construction and drilling activities. Potential significant impacts resulting from the proposed project include the depletion of gas reserves from the Mesaverde Group, reactivation of stabilized sand dunes, and visual resource degradation in areas with 80-acre spacing patterns. Cumulative impacts from additional development (i.e., 900 new wells and associated facilities) in the Creston/Blue Gap Area beyond the levels identified in this EIS, could be significant for some area resources (e.g., surface water quality, vegetation, wildlife, livestock grazing). After the project is completed and the area reclaimed, there would be negligible impacts to the character of the area. No adverse effects are anticipated for threatened and endangered species. There would also be beneficial project impacts associated with lessened U.S. dependence on foreign energy sources; increased use of a relatively clean fuel source; increased tax revenues (i.e., approximately $73 million in state and local production taxes and $48 million in federal royalties in the first 25 years); increased employment; and increased use of local goods and services.

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1.0 INTRODUCTION

Snyder Oil Corporation (SOCO) and other operators, including Amoco Production Company (Amoco), Union Pacific Resources Company (UPRC), and Ensign Oil & Gas New Mexico, Inc. (EOG) propose to explore and develop natural gas reserves on approximately 207,746 acres (144,497 federal, 54,463 private, and 8,786 state) in the Creston/Blue Gap Area (CBGA) of Carbon and Sweetwater Counties, Wyoming (Map 1.1). The CBGA is located predominantly in southwestern Carbon County, Wyoming, within Townships 14 through 19 North, Ranges 91 through 94 West. The CBGA is approximately 35 mi southwest of Rawlins with access from Interstate Highway 80 to Creston and south along State Highway 789, which bisects the area from north to south. The entire CBGA is within the Bureau of Land Management (BLM) Great Divide Resource Area of the Rawlins BLM District.

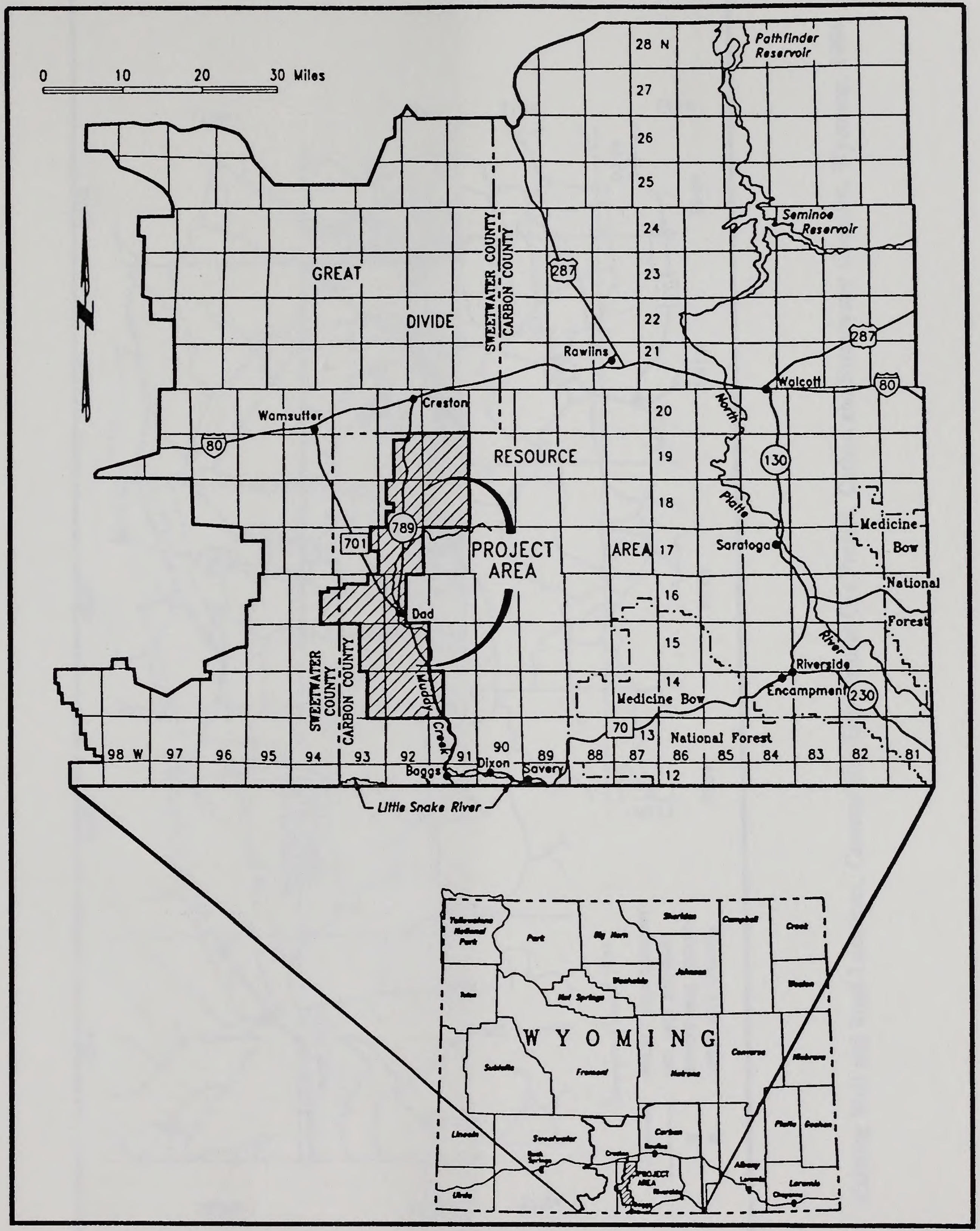
Previous development in the CBGA has been extensive and includes several active natural gas fields and federal units (e.g., Barrel Springs, Blue Gap, Duck Lake, Creston, and Hangout Ridge) (Map 1.2), some of which include active well drilling programs. Approximately 134 permitted well locations with active producing wells and associated production facilities, roads, and pipelines currently exist in the CBGA (Maps 1.2 and 1.3), and approximately 12 additional wells will be permitted on the CBGA in the spring of 1994. Maintenance of existing wells will continue as authorized by existing permits during the preparation of this Environmental Impact Statement (EIS). Most well locations in the CBGA are spaced at one location per section (640 acres).

SOCO and the other operators propose to drill, complete, operate, and reclaim 250 well locations (275 wells) on a 160 acre spacing pattern (i.e., approximately four wells per mi^2) within portions of the CBGA beginning in the summer of 1994 and continuing into 1997 and beyond. To minimize the extent of ground disturbance and maximize resource recovery, multiple wells may be drilled from a single location. The majority of new wells would be classified as infill or development wells, and most would be completed in the Mesaverde Group.

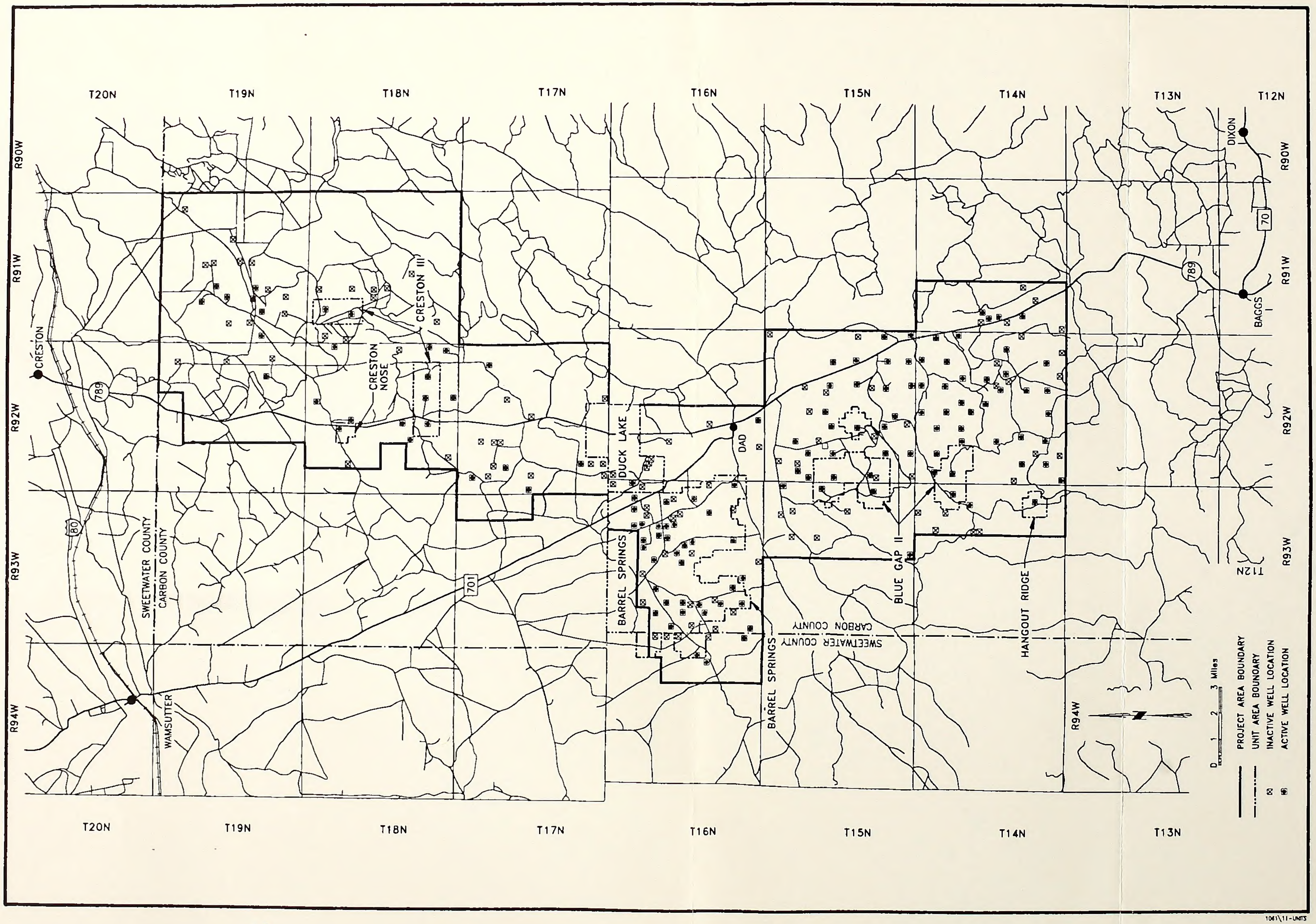
A total of approximately 40 mi of new road (0.16 mi per location) and 115 mi of new natural gas pipeline (0.46 mi per location) would be constructed for the proposed project. Additionally, one new compressor station (8.0 acres) would be built. Existing ancillary facilities in the CBGA, including two compressor stations, a water disposal facility, and four water wells (Map 1.3), would be expanded as necessary to accommodate the increased gas supplies anticipated as a result of this project.

This EIS was prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and is intended to provide decision makers and the public with a complete and objective evaluation of impacts, both beneficial and adverse, resulting from the proposed action and reasonable alternatives. This document has been prepared in compliance with all applicable regulations and laws passed subsequent to NEPA, including Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1500-1508); U.S. Department of Interior (USDI) guidelines in *Department Manual 516, Environmental Quality* (USDI 1980); and guidelines listed in BLM *National Environmental Policy Act Handbook, H-1790-1* (BLM 1988a).

The federal action for the proposed development consists of the continued authorization of construction, drilling, production, operation, and reclamation activities. The analysis in this EIS and all subsequent decisions documented in the Record of Decision (ROD) will guide the implementation of the proposed action; however, these documents are not the final environmental reviews upon which approval of all actions in the area will be based. Site-specific Environmental



Map 1.1 General Location Map, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.



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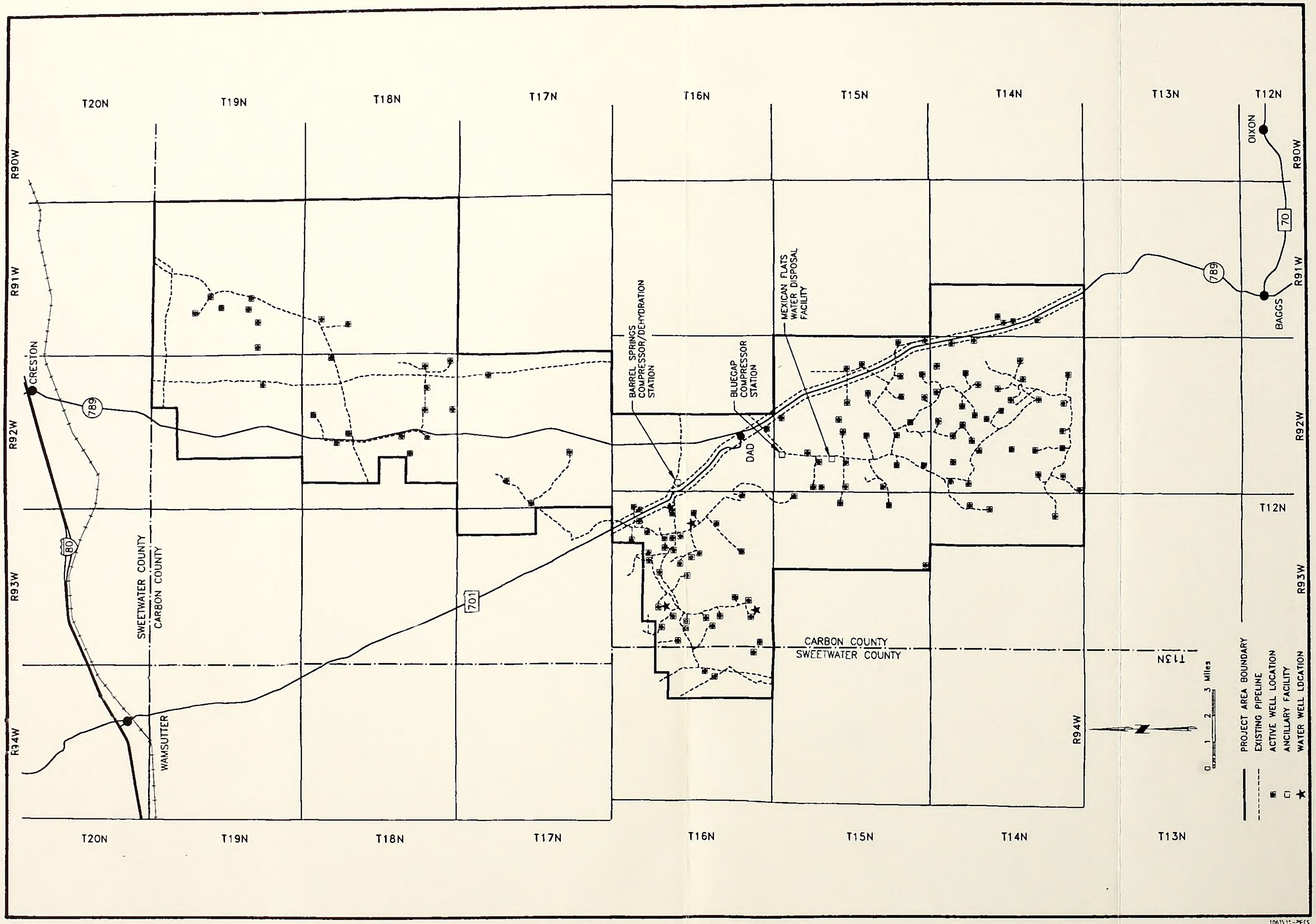


Map 1.3 Existing Pipeline and Ancillary Facility Locations, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Assessments (EAs) and associated decision documents for each Application for Permit to Drill (APD) or Sundry Notice (e.g., categorical exclusions and/or administrative decisions) will be required for individual wells, ancillary facilities, roads, and pipelines.

This EIS, through interdisciplinary preparation and review, consideration of reasonable alternatives, and public participation, serves as a vehicle for:

- defining project activities and related environmental impacts,
- assisting the decision making process, and
- identifying and developing appropriate mitigation measures to minimize environmental impacts.

1.1 PURPOSE AND NEED

SOCO and the other area operators' proposed action is to construct, drill, operate, and reclaim approximately 250 natural gas well locations (275 wells) within the CBGA of southcentral Wyoming. This action would allow SOCO and other area operators to exercise their leaseholder's rights to recover natural gas from the CBGA. This gas could then be provided to companies distributing and supplying gas to consumers, thereby benefiting consumers by making additional gas supplies available and reducing U.S. dependence on foreign energy.

The BLM oil and gas leasing program encourages development of domestic oil and gas reserves and reduction of U.S. dependence on foreign energy supplies. Natural gas is seen as an integral part of the U.S. energy future due to the availability of the gas and the existing market delivery infrastructure.

1.2 RELATIONSHIP TO EXISTING POLICIES, PLANS, AND PROGRAMS

The development of federal gas leases is an integral part of the BLM gas leasing program under the authority of the Mineral Leasing Act of 1920, the Federal Land Policy and Management Act of 1976 (FLPMA), the Federal Onshore Oil and Gas Royalty Management Act of 1982, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987. The BLM's Great Divide Resource Management Plan (RMP) (BLM 1987, 1988b) and subsequent ROD (BLM 1990a:30) reviewed all public lands in the CBGA and determined them to be suitable for oil and gas development, subject to certain stipulations.

This EIS is tiered to the Great Divide Resource Area RMP (BLM 1987, 1988b) and ROD (BLM 1990a). The proposed project would be consistent with management decisions, requirements, and guidelines specified in the RMP and ROD, and other existing and relevant federal, state, and county documents. The proposed project is also consistent with the *Carbon County Land Use Inventory* (University of Wyoming 1991), the Sweetwater County land use plan (THK Associates, Inc. 1977), and the Wyoming state land use plan (Wyoming State Land Use Commission 1979).

1.3 AUTHORIZING ACTIONS

The proposed action would comply with all relevant federal, state, and local laws. Table 1.1 lists all authorizing actions required for project compliance.

Drilling of federal minerals is subject to the BLM's Onshore Oil and Gas Order Nos. 1 through 8 (43 CFR 3164). The drilling programs of SOCO and the other operators would require BLM approval prior to the commencement of drilling. Federal review of drilling programs would be accomplished through the APD process. BLM Onshore Order No. 1 requires that an applicant comply with the following conditions:

- all activities must comply with applicable federal laws and regulations and state and local laws applicable to federal leases,
- operations must conform with lease terms and stipulations and conditions of approval,
- operations must result in the diligent development and efficient recovery of resources,

Table 1.1 Federal, State, and County Authorizing Actions, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Agency	Nature of Action
CARBON AND SWEETWATER COUNTIES	Building/conditional use permits for all drilling locations and/or new structures. Special use permits for pipelines. Small wastewater system permits, where applicable. Driveway access permits, where new roads intersect with county roads. Road use agreements and/or oversize trip permits, when traffic on county roads exceeds established size and weight limits or where the potential for excessive road damage exists. Zone change plans and/or certificates, where applicable. Filing fees. Noxious weed control.
USDI	
BLM, Rawlins District, Great Divide Resource Area	Approval of APDs, access roads, pipelines, treatment facilities, compressor stations, wastewater disposal, and abandonment procedures. Sundry Notices. Well drilling and plugging regulation including blowout prevention. Rights-of-way (ROWs) for off-lease/off-unit facilities (e.g., access roads and pipelines). Approval to vent gas. Approval to dispose of produced water. Approval to conduct geophysical operations.
U.S. Fish and Wildlife Service (USFWS)	Review of impact on federally listed and candidate threatened and endangered (T&E) fish, wildlife, and plant species.

Table 1.1 (Continued)

Agency	Nature of Action
U.S. DEPARTMENT OF THE ARMY	
U.S. Army Corps of Engineers (COE) Omaha District	Section 404 permits as necessary for compliance with the Clean Water Act.
	Coordination with COE regarding all necessary placement of dredged or fill material in area waters and their adjacent wetlands, as specified in 40 CFR 230.
U.S. DEPARTMENT OF TRANSPORTATION	Conformance with pipeline regulations (49 CFR 191 and 49 CFR 192).
U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)	Resource Conservation and Recovery Act (RCRA) permits for treatment, storage, or disposal of hazardous waste.
	Oil Pollution Act of 1990 (storage capacity of >1,000,000 gallons).
WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY (WDEQ)	
Air Quality Division (AQD)	Issue air quality construction and operation permit.
Water Quality Division (WQD)	Approval of sewage treatment facilities (groundwater pollution control permit).
	Section 401 certification for stream crossings.
	Approval of wastewater disposal.
	Stormwater Pollution Prevention Plan (402 Permits).
	Enforcement of State Water Quality Rules and Regulations (surface water and groundwater).
WYOMING HIGHWAY COMMISSION	Conformance with applicable size and weight limits for trucks.

Table 1.1 (Continued)

Agency	Nature of Action
WYOMING OIL AND GAS CONSERVATION COMMISSION (WOGCC)	Primary authority for drilling on state and privately held mineral resources.
	Spacing orders and exceptions (WOGCC Rule 302).
	Authority to allow or prohibit venting of gas.
	Regulation of drilling, completion, production operations, plugging, and abandonment of wells.
	Permits to drill and blowout preventions.
	Issue evaporation pond construction permits.
	Approval to conduct geophysical operations.
WYOMING PUBLIC SERVICE COMMISSION	Certificate to act as common carrier for natural gas.
WYOMING STATE ENGINEER'S OFFICE (WSEO)	Temporary permit to use and store water.
	Water well permits.
	Dewatering permits (Form U.W. 5).
WYOMING STATE HISTORIC PRESERVATION OFFICE (SHPO)	Adherence to Section 106 of the National Historic Preservation Act and Advisory Council Regulations (36 CFR 800).
	Programmatic Agreement and/or consultation for cultural resource inventory, evaluation, and mitigation.

- operations must protect the lease from drainage,
- all activities must contain adequate safeguards to protect the environment,
- disturbed lands must be properly reclaimed,
- all activities must conform with current available technology and practice,
- underground sources of fresh water must be protected from fluid injection operations, and
- all activities must protect public health and safety.

Onshore Order No. 1 specifically states that, "lessees and operators shall be held fully accountable for their contractor's and subcontractor's compliance with the requirements of the approved permit and/or plan."

Pipeline and road ROW permits and temporary use permits on BLM-managed lands would be issued under the authority of the Mineral Leasing Act of 1920 or Title V of FLPMA. The project would adhere to management directions specified for mineral development in the BLM Great Divide Resource Area RMP (BLM 1987, 1988b) and ROD (BLM 1990a:30). Natural gas pipeline ROW permits would be obtained by SOCO and other area operators as appropriate. Access roads would be authorized in conjunction with well locations through the ROW and APD processes and would conform to BLM lease stipulations for CBGA lands administered by the BLM. Common lease stipulations are presented in Appendix A and include provisions for the protection of:

- wildlife resources,
- cultural resources,
- paleontological resources,
- wetland/riparian areas,
- current land uses,
- water resources, and
- visual resources.

1.4 PUBLIC INVOLVEMENT, ISSUES AND CONCERNS, AND CONSULTATION

In late September and early October 1993, a cover letter and scoping statement were mailed to government agencies, municipalities, Native American Tribes, grazing permittees, lease operators, industry representatives, environmental organizations, and other agencies and individuals having a potential interest in the proposed project. Local and regional media received the scoping statement and a press release. The scoping statement explained the proposed project and requested comments concerning issues and concerns that should be addressed in the EIS. Comment letters were accepted until November 1, 1993, and 13 comment letters were received. A list of respondents is presented in Table 1.2. All written comments on the proposed project are considered in this EIS.

Issues and concerns identified during scoping by the public, the BLM, and other governmental organizations regarding the proposed project that, among others, are considered in this EIS are:

- reasonable access to public lands,
- expeditious completion of the EIS,
- use of best management practices during construction and production operations,
- need for a Storm-water Pollution Prevention Permit,
- unreasonable restrictions on construction of utility and pipeline facilities,
- road surfacing,
- potentially minable coal beds,
- highly erodible and unstable soils,
- paleontological resources,
- surface water and groundwater quality and quantity protection,
- reclamation and reseeding with native species,
- mobilization of selenium,

Table 1.2 Scoping Responses, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

CITIZENS GROUPS

Carbon County Coalition

GOVERNMENTAL AGENCIES

Federal

USFWS

State of Wyoming

WDEQ
Wyoming Game and Fish Department (WGFD)
Wyoming Geological Survey (WGS)
Wyoming Public Service Commission
SHPO

INDIVIDUALS

Alan C. Ambler
Carla Corsi
Ray and Kathleen Weber

INDUSTRY

Bjork, Seavy, Lindley, and Danielson, P.C.
Independent Petroleum Association of Mountain States

NATIVE AMERICAN TRIBES

Ute Indian Tribe (Fort Duchesne, Utah)

- noxious weed control,
- wetland and aquatic habitats,
- wildlife and fisheries,
- direct and indirect wildlife habitat loss,
- big game winter range and migrations,
- sage and sharp-tailed grouse,
- raptor protection,
- poaching impacts and mitigations,
- sensitive, priority, and T&E species including downstream fish species,
- wild horses,
- cultural/historic resources including historic trails and adherence to National Historic Preservation Act and Advisory Council regulations,
- conformance with current and future land uses,
- increased human activity,
- impacts to recreation (e.g., hunting),
- social and economic effects to local communities,
- revenue generation,
- increased jobs,
- visual resource sensitivity, and
- cumulative impacts.

This EIS was prepared by a third-party contractor (Mariah Associates, Inc. [Mariah], Laramie, Wyoming), with the BLM (Rawlins District Office and Great Divide Resource Area Office, Rawlins, Wyoming) as the lead agency providing guidance, input, participation, and independent evaluation. The BLM, in accordance with 40 CFR 1506.5 (a) and (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

2.0 THE PROPOSED ACTION AND ALTERNATIVES

Four alternatives are evaluated in this EIS:

- the proposed action - 250 locations with approximately 275 wells on a 160 acre spacing pattern,
- Alternative 1 - 175 locations with approximately 200 wells on a 160 acre spacing pattern,
- Alternative 2 - 300 locations with approximately 330 wells on both 160 acre and 80 acre spacing patterns, and
- no action - the project would not proceed.

The types and acreage of disturbance existing in the CBGA and that expected from the proposed action and Alternatives 1 and 2 are given in Table 2.1. Additional alternatives involving more wells on closer spacing patterns and fewer wells on less dense spacing patterns were considered but rejected for economic and/or environmental reasons (see Section 2.3).

2.1 THE PROPOSED ACTION

2.1.1 Overview

The proposed action for the Creston/Blue Gap Natural Gas Project entails the drilling, completion, production, routine operation, and reclamation of 250 well locations (approximately 275 wells) within and adjacent to existing natural gas fields in southwestern Carbon and southeastern Sweetwater Counties, Wyoming (Map 2.1). The CBGA is located approximately 35 mi southwest of Rawlins and 7 mi north of Baggs, Wyoming (Map 1.1). Access to the CBGA would be from Interstate Highway 80 at Creston and south along State Highway 789, which runs north/south bisecting the general area. The CBGA lies within portions of Townships 14 through 19 North, Ranges 91 through 94 West and includes approximately 207,746 acres of mixed federal (144,497 acres), state (8,786 acres), and private (54,463 acres) lands. The CBGA encompasses all or portions of the existing Creston, Barrel Springs, Duck Lake, Blue Gap, and Hangout Ridge Units and adjacent ununitized areas. Operators in the CBGA, including SOCO, Amoco, UPRC, and EOG, would use standard industry drilling and production procedures as currently employed in the CBGA and at other natural gas fields throughout Wyoming and the region. Unique procedures associated with this proposed action are specifically detailed below. Mitigation measures to protect resources during the development and operation of the proposed action are discussed in Section 2.1.5 and Chapter 5.0.

Most existing well locations in the CBGA are spaced at one location per section (640 acres) for gas production primarily from the Mesaverde Group (i.e., the Almond, Pine Ridge Sandstone, Allen Ridge, and Haystack Mountains Formations); however, there have been five WOGCC orders covering 12 sections in the CBGA allowing one to three additional wells per section in the Mesaverde Group. Some existing wells in the CBGA are completed in secondary gas producing strata including the Lance and Lewis Formations. SOCO and EOG have made application with the WOGCC to increase the well density within portions of the CBGA in order to ensure the efficient recovery of natural gas from the Mesaverde Group. This increased well density, if approved, would allow for a total of four wells per section (i.e., 160 acres per well) within approved areas.

Definitive predictions on the total number of wells and the timing of drilling operations are not currently possible. However, for the purposes of this EIS, SOCO and the other CBGA operators anticipate that, with positive results from future drilling and testing operations, a maximum of 275 wells (250 locations) would be developed, and wells would be drilled at a rate of 55 to 110 per year between 1994 and 1997. To minimize the extent of ground disturbance and maximize resource recovery, directional drilling may be used in certain areas (e.g., steep slopes, crucial winter range) such that multiple wells would be completed at a single location, where economically feasible. It is estimated that during peak drilling seasons a maximum of nine rotary drilling rigs

Table 2.1 Types and Acreages of Existing and Proposed Disturbance, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

		Proposed Action[2]		Alternative 1[3]		Alternative 2[4]	
Disturbance Type	Existing[1]	New[5]	Life of Project[6]	New[5]	Life of Project[6]	New[5]	Life of Project[6]
Well locations	248	625	375	438	263	750	450
Roads	3,900	267	175	187	122	320	209
Pipelines[7]	125	348	0	245	0	418	0
Ancillary facilities[8]	31	8	8	8	8	8	8
Subtotal	4,304	1,248	558	878	393	1,496	667
Existing[9]	NA	0	1,691	0	1,186	0	2,028
Total	4,304	1,248	2,249	878	1,579	1,496	2,695

[1] Includes disturbance from all existing well locations, roads, pipelines, and ancillary facilities present in the CBGA, including 134 active well locations, 105 abandoned/shut-in locations (assumed to be at least 70% reclaimed), 536 mi of road with an assumed average disturbance area width of 60 ft, 207 mi of pipelines with an assumed average ROW of 50 ft (assumed to be 90% reclaimed), and ancillary facilities including two compression/treatment facilities (19 acres), one water disposal facility (6 acres), and four water wells (6 acres).

[2] Assumes disturbance from 250 new well locations, a maximum of 40 mi of new road (55 ft ROW/disturbance width), 115 mi of new pipelines (50 ft ROW, 25 ft disturbance width outside road ROW), a new 8.0 acre compression facility, and 1,691 acres of existing road, pipeline, and ancillary facility disturbance.

[3] Assumes disturbance from 175 new well locations, 28 mi of new road, 81 mi of new pipelines, a new 8.0 acre compression facility, and 1,186 acres of existing road, pipeline, and ancillary facility disturbance.

[4] Assumes disturbance from 300 new well locations, 48 mi of new road, 138 mi of new pipelines, a new 8.0 acre compression facility, and 2,028 acres of existing road, pipeline, and ancillary facility disturbance.

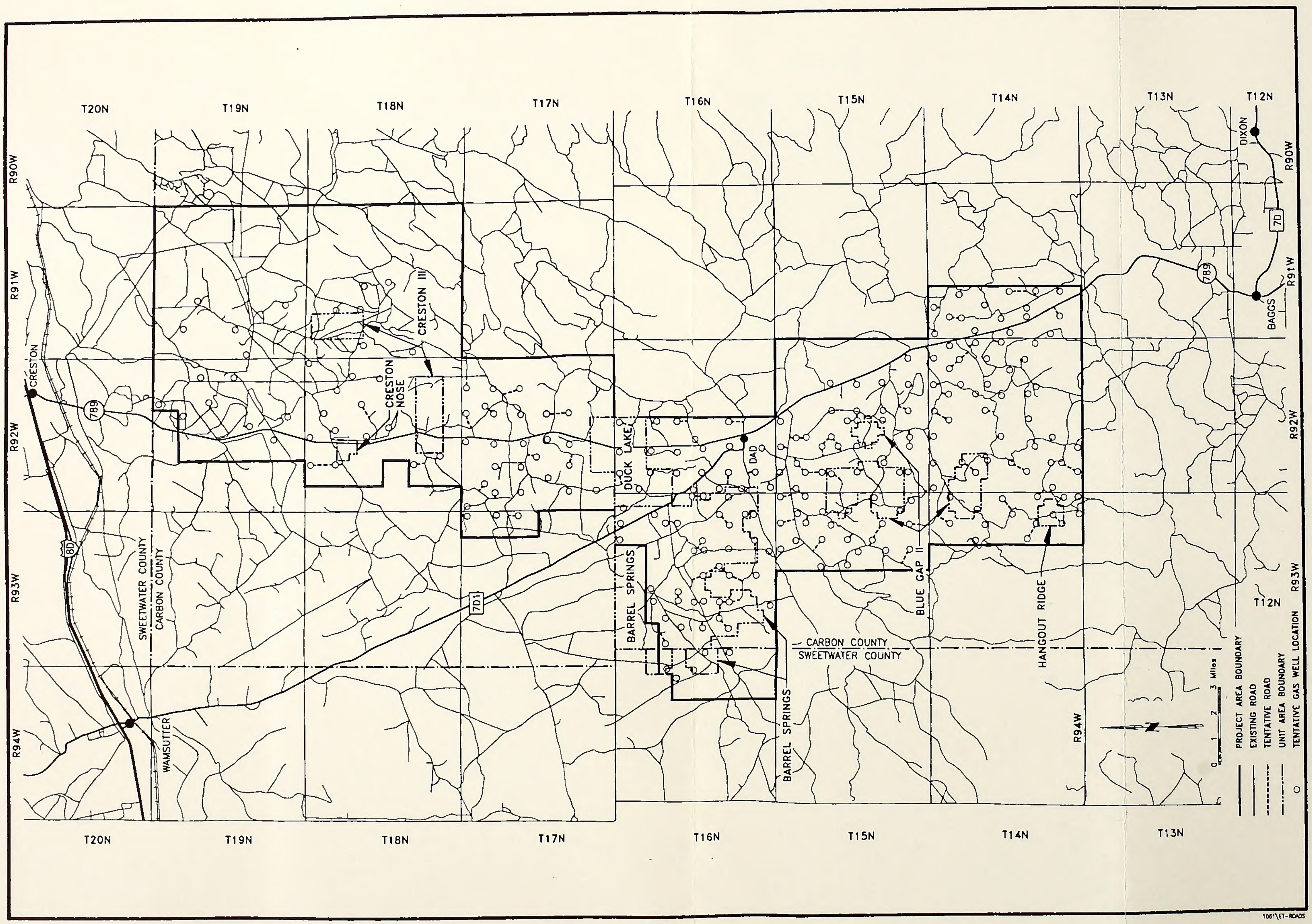
[5] Assumes new disturbance of approximately 2.5 acres for well locations, the entire 55 ft ROW for roads, the 25 ft of pipeline ROWs outside of road ROWs, and 8.0 acres for the compression facility.

[6] Assumes adequate reclamation of 1.0 acre at each new well location, 19 ft of all new road ROWs, and the entire 25 ft of new pipeline ROWs outside of road ROWs; includes disturbance from the new compression facility and some existing disturbance from roads, pipelines, and ancillary facilities since they would be required for the proposed project (see footnote 9).

[7] Twenty-five feet of pipeline ROWs would be within road ROWs.

[8] Includes existing disturbance of 11.0 acres for the Barrel Springs compression/treatment facility, 8.0 acres for the Blue Gap compression facility, 6.0 acres for the Mexican Flats water disposal facility, 6.0 acres for existing water wells, and 8.0 acres from the newly proposed compression facility.

[9] Includes all existing disturbance necessary for the proposed action and alternatives, including 27-49% of existing road disturbance (1,055-1,897 acres), 80% of existing pipeline disturbance (100 acres), and all existing ancillary facility disturbance (31 acres).



Map 2.1 Tentative Well and Road Locations, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

would operate simultaneously, and although some level of activity would be continual, peak drilling and construction would be scheduled for the summer and fall.

Development of the 250 location proposed action would require approximately 40 mi of new road and 115 mi of new natural gas pipeline. The exact locations of wells, pipelines, and access road corridors cannot currently be determined; however, they would be sited to minimize environmental impacts, and existing roads and pipelines in the CBGA would be utilized to the greatest extent possible. Road and pipeline construction would primarily occur concurrently with well pad construction. Tentative well, road, and pipeline locations for the proposed action are shown on Maps 2.1 and 2.2. A summary of the types and acreages of existing and proposed disturbance associated with the proposed project is given in Table 2.1.

The anticipated life-of-project (LOP) is expected to be from 30 to 50 years, after which production facilities would be removed or abandoned, and disturbed areas reclaimed.

Standard industry practices would be employed to protect environmental, public, and employee health and safety in compliance with provisions of BLM Onshore Oil and Gas Orders (43 CFR 3164), approved APDs, lease stipulations (Appendix A), Notices to Lessees (NTLs), WOGCC rules and regulations (WOGCC 1991), and any written instructions or orders of the BLM Authorized Officer. Use of blowout preventers and other protective measures to promote safety and ensure environmental protection would be specified in APDs, which are reviewed and approved by the BLM. Procedures for handling potential emergencies and/or accidents within the CBGA (e.g., spills, fires, blowouts, injuries) would follow federal and state reporting, investigation, and mitigation requirements as well as those identified in existing field operations and safety manuals (SOCO n.d., 1992) and Spill Prevention Control and Countermeasure Plans (see Appendix B). Garbage and refuse generated as a result of the proposed action would be hauled to approved sanitary landfills/disposal sites. Standard portable chemical toilets would be provided at each location, and waste would be hauled away and disposed of at approved sites.

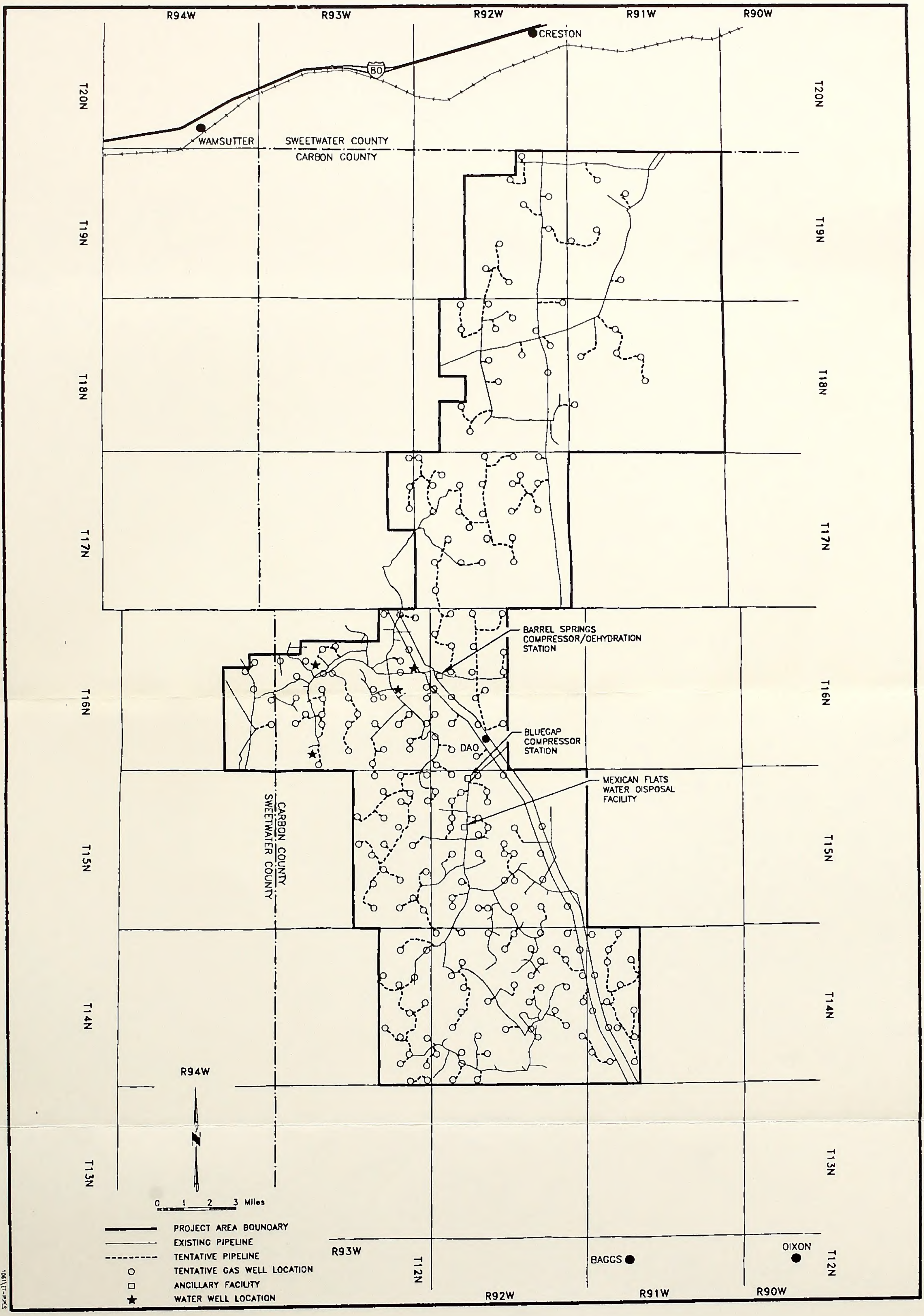
2.1.2 Construction, Drilling, and Completion

2.1.2.1 Road Construction and Use

Access to the CBGA would be from State Highway 789 and then along improved roads currently being used to access existing wells in the area. Existing and tentative proposed road routes within the CBGA are shown on Map 2.1. Three road types (i.e., collector, local and resource roads) would be required. Collector and local roads provide the access network within the CBGA, and resource roads are the spur roads which provide access to individual well locations from local and collector roads. Although the exact location and type of each proposed road within the CBGA cannot currently be determined, proposed roads would be located to minimize disturbance, avoid sensitive resources (e.g., raptor nests, cultural resource sites), and maximize transportation efficiency. Approximately 40 mi of new roads (0.16 mi per location) and 230 mi of existing roads would be required. Some existing roads on the CBGA would be upgraded to meet BLM road standards and accommodate additional traffic requirements.

Site-specific analysis under standard BLM procedures would be conducted on all roads during development, and proper authorizations (i.e., ROW permits, APDs on unitized areas) would be obtained for all roads prior to construction. Road authorization and use would be coordinated with other users, and roads would be constructed following guidelines specified in the BLM road standards manual, Section 9113 (BLM 1985, 1991a).

All roads would be constructed for the specific purpose of field development and well access.



Map 2.2 Tentative Well and Pipeline Locations, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Roads would be designed, built, surfaced, and maintained to minimize disturbance and provide safe operating conditions at all times as determined by the BLM. All roads on BLM and state lands would be appropriately surfaced.

Site-specific surveys would be conducted prior to disturbance, and roads would be designed and sited to ensure safe operating conditions. Sensitive areas and unsuitable topography would be avoided, where possible. Permanent roads across public lands would be designed by or under the direction of a licensed professional engineer and road construction would be monitored by a qualified professional engineer, as deemed appropriate by the BLM. All roads would be constructed with adequate drainage and erosion control structures (e.g., relief culverts, drainage culverts, wing ditches, water bars). Road construction in areas with water-spreader dikes or contour furrows would be avoided where possible. To further decrease potential impacts, the number and miles of roads would be limited by discouraging development of looped roads and by accessing well locations from short spurs off local roads, where feasible. Roads would be closed and reclaimed by CBGA operators when they are no longer required for the project, unless otherwise directed by the BLM, private landowner, or other authorizing agency.

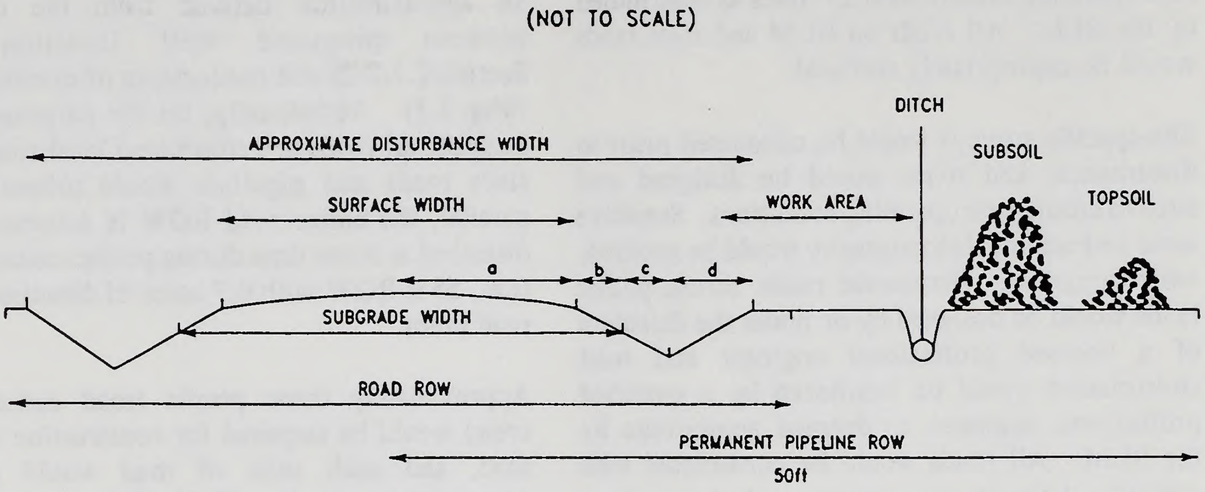
Figure 2.1 illustrates a typical road cross section with a parallel pipeline ROW (see Section 2.1.2.6). The average travel surface width for gravel-surfaced local and resource roads would be 20 ft and 14 ft with turnouts (100 ft long with 50 ft tapers spaced intervisibly at 1,000 ft), respectively.

Surface disturbance would be contained within approved ROWs and would average 52 ft for collector roads (60 ft ROW), 48 ft for local roads (55 ft ROW), and 40 ft for resource roads (50 ft ROW). Disturbance width may increase in areas of rugged topography due to cuts and fills necessary to construct roads on slopes. Since the exact location, type, and extent of collector, local, and resource roads cannot currently be determined, the length of proposed new roads is an approximation derived from the distance between proposed well locations (see Section 2.1.2.2) and the location of existing roads (Map 2.1). Additionally, for the purpose of this analysis, all roads are considered local roads, and since roads and pipelines would primarily run parallel, the entire road ROW is assumed to be disturbed at some time during project construction (i.e., 55 ft ROW with 6.7 acres of disturbance per road mile).

Approximately three people (road construction crew) would be required for construction of each road, and each mile of road would require three days to complete (Table 2.2). Roads would be surfaced as necessary with locally available scoria or crushed rock according to BLM guidelines.

Topsoil removed during road construction would be placed in elongated rows within road ROWs and seeded to prevent erosion. Topsoil would be respread on approximately six to nine feet on both sides of all roads (i.e., backslopes), and these areas would be revegetated as soon as possible after production testing indicates the well will be a producer and pipelines are installed. The entire road ROW to wells that are determined to be unproductive would be reclaimed as soon as practical using stockpiled topsoil and appropriate seeding techniques. All newly developed roads would be reclaimed upon project abandonment unless otherwise directed by the BLM, private landowner, or other authorizing agency.

Estimated traffic requirements for the proposed project are given in Table 2.3. Crews would likely use a crew vehicle or car pool. Approximately 5 to 10 round trips per day would be required for each well during construction, drilling, completion, and testing phases (i.e., approximately the first five weeks of development at each well). Wells would primarily be visited every other day during operations with an additional two round trips per well per day for



	MINIMUM SUBGRADE WIDTH (ft)	MINIMUM SURFACED TRAVELWAY WIDTH (ft)	a (ft)	b (ft)	c (ft)	d (ft)	APPROXIMATE DISTURBANCE WIDTH (ft)	ROW WIDTH (ft)	DESIGN SPEED (mph)
RESOURCE ROAD	16	12	6	2	4	8	40	50	15-30
LOCAL ROAD	24	20	10	2	4	8	48	55	20-50
COLLECTOR ROAD	28	24	12	2	4	8	52	60	30-50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS

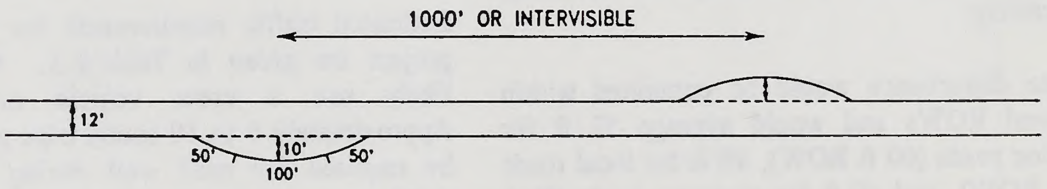


Figure 2.1 Typical Parallel Road/Pipeline Cross Section with Width Specifications for the Three Proposed Road Types, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Table 2.2 Estimated Employment Requirements[1], Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Employment Category	Number of Personnel for Each Well/ Operation Crew	Number of Simultaneously Active Crews	Total Number of Individuals	Total Number of Person-years[2]
Access road and well pad construction (5 days/location)	3	1	3	14.4
Rig transport and rig-up operations (2 days/well)	20	1-9	20-180	42.3
Drilling (20 days/well)	15[3]	1-9	15-135	317.3
Completion (5 days/well)	5-30[4]	1-9	5-75	58.2
Testing (3 days/well)	3	4	12	9.5
Pipeline and ancillary facility installation (10 days/location)	6	1	6	57.7
Well operations				
- Workovers (5 days every 10 years per well)	7	1	7	74.0
- Operations (LOP)	1	7	7	210.0
Reclamation (3 days/location)	3	1	3	8.7
Total	63-88	--	78-428	792.1

[1] Assumes a maximum of 250 locations are constructed and all 275 wells are drilled and completed as producers.
[2] Based on 260 workdays per year.
[3] Five people for three shifts.
[4] Thirty people during fracturing only; only one fracturing crew would be required.

Table 2.3 Estimated Traffic Requirements[1], Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Type of Traffic	Round Trips per Well/Location	Total Round Trips (LOP)
Access road and well pad construction (5 days/location)	40-60	10,000-15,000
Rig transport and rig-up operations (2 days/well)	30	8,250
Drilling activities (20 days/well)	120-140	33,000-38,500
Completion (5 days/well)	30	8,250
Testing (3 days/well)	3	825
Pipeline and ancillary facility installation (10 days/location)	40	10,000
Well operations		
- Workovers (5 days every 10 years per well)	20	5,500
- Operations (LOP)[2]	5,400	74,250-99,000
Reclamation (3 days/location)	9	2,250

[1] Assumes a maximum of 250 locations are constructed and all 275 wells are drilled and completed as producers.

[2] Assumes wells produce every day; each well would be visited every other day, and approximately 15-20 wells would be visited daily by an operations crew (i.e., pumper).

a five day period every 10 years for workovers. Three round trips per day per well location would be required during reclamation.

During drilling and operations, project-related traffic would be restricted to State Highway 789, County Road 701, and roads developed for the project. Use of unimproved roads would be allowed only in emergency situations. SOCO and other CBGA operators would instruct project personnel and contractors to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions, to assure safe and efficient traffic flow. Signs would be placed along roads as directed by the BLM to identify speed limits, travel restrictions, and other standard traffic control information.

All equipment would be maintained in good working order to minimize impacts to air quality and noise and to ensure human safety. In addition, newly developed or improved roads through crucial wildlife areas would be gated and locked at appropriate locations as directed by the BLM to prevent unnecessary wildlife disturbance. Keys would only be provided to essential project personnel (e.g., pumpers) and area administrators (e.g., BLM, WGFD, County Sheriff's Office, etc.).

2.1.2.2 Well Pad Construction

While exact well locations have not yet been determined, tentative locations are shown on Map 2.1. NEPA compliance procedures will be conducted on all APDs, Sundry Notices, and ROW permit applications filed for approval by the BLM.

The typical well pad during drilling operations would be approximately 275 ft by 350 ft with a 50 ft by 150 ft excess material stockpile (approximately 2.5 acres) (Figure 2.2). A reserve pit (approximately 100 ft by 150 ft by 10 ft) would be excavated at each well location to contain drilling fluids, cuttings, and water produced during drilling. Pits would be lined as necessary to protect groundwater and retain water in the pit per BLM and/or WOGCC requirements; a determination regarding the lining of pits would be made during site-specific analyses conducted during the APD process. Total excavation and earth moving associated with well pad construction would be site-specific, but would generally average approximately 15,000 yd^3 of material at each drilling location. Of this total, approximately 2,000 yd^3 would be topsoil, 5,000 yd^3 would be reserve pit spoil, and the remainder would be cut material from the pad. Well pad construction for multiple well locations would be similar to that for single well locations; however, locations may be slightly larger.

Well locations would be cleared of vegetation and topsoil, and these materials would be stockpiled together for future use in reclamation. The well pad location would be leveled using standard cut-and-fill construction techniques and machinery. At well locations with level topographic conditions, where minimal cut-and-fill operations are applied, and/or where topsoil is saline and/or alkaline and its removal could create depressions capable of retaining water, topsoil would be stripped only from the reserve pit and spoil stockpile areas to facilitate future reclamation activities. Detailed engineering design plans and well pad construction monitoring by a qualified professional engineer would be conducted in areas of rough terrain or where significant erosion/construction hazards exist. Well pad and access road construction would require approximately five days per location (Table 2.2).

2.1.2.3 Drilling Operations

Following construction of the access road and well pad, a rotary drilling rig would be transported to each location and erected on site. Rig transport and on-site assembly would be completed in approximately two days and involve about 20 people per site (Table 2.2). One to nine rotary drilling rigs rated to accommodate anticipated final well depths of approximately 8,000 to 12,000 ft would be utilized. All drilling operations and other well site activities would be conducted in compliance with applicable BLM, WOGCC, and

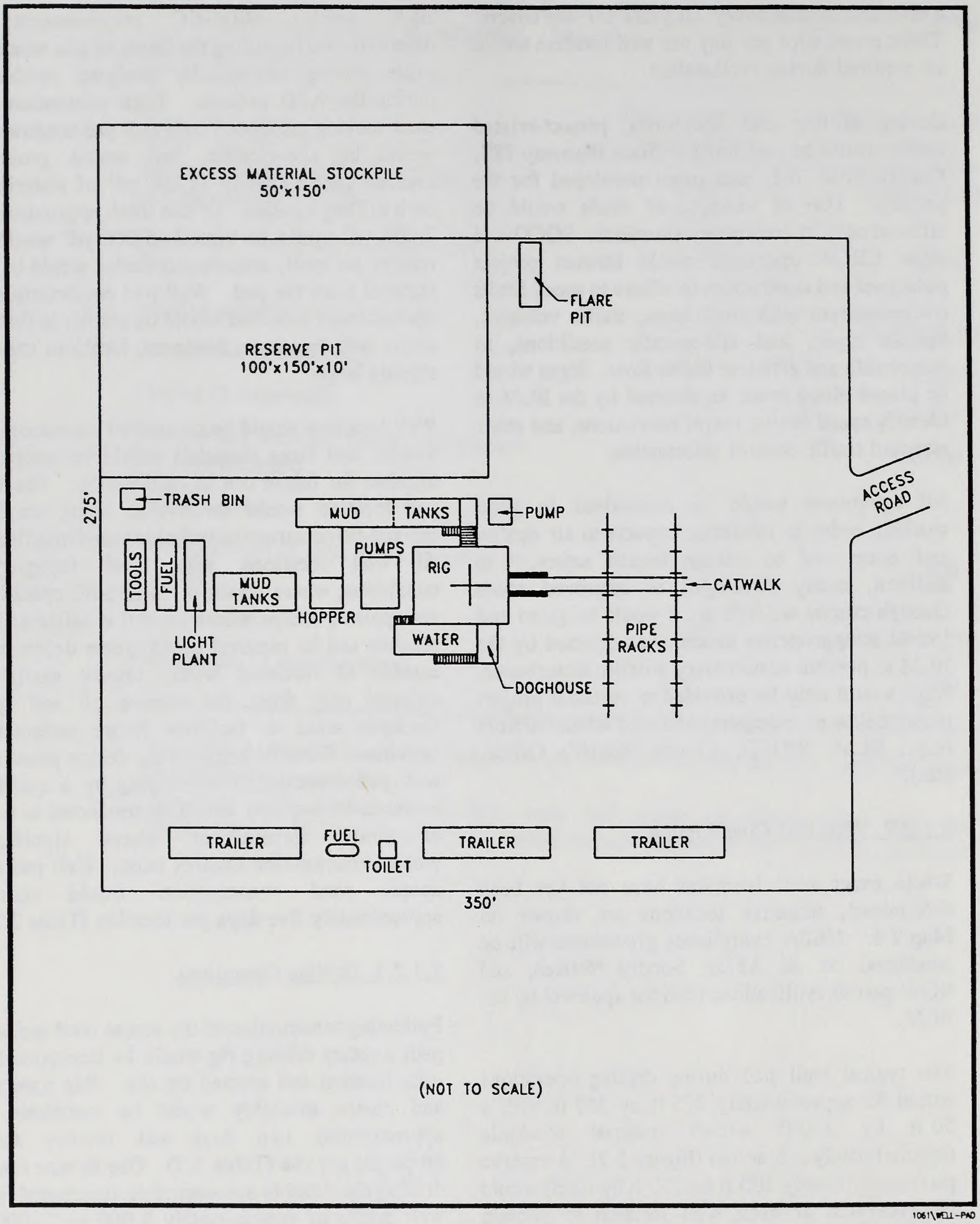


Figure 2.2 Typical Well Pad Layout During Drilling, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

WDEQ rules and regulations. Most wells would be completed in the Mesaverde Group; however, secondary gas reserves may be encountered in the Lance and Lewis Formations, and some wells may be completed in these formations. Each well would require approximately 20 days to drill, and during active drilling operations, 15 people would be working on each site (5 people per 8 hour work shift). Drilling operations would be similar for all wells; however, where directional drilling is employed, drilling operations would require additional time.

Fresh water would be used for drilling the first 5,000 to 7,000 ft, and water-based muds would be used for the remainder of the drilling operations. Drilling muds consist of clays and other additives that are used in standard industry procedures. Drilling muds, cuttings, and water would be stored in the reserve pit (Figure 2.2). The reserve pit would be fenced to protect wildlife. Netting (1 inch mesh), to protect waterfowl and other birds, and pit liners, to protect shallow groundwater aquifers, would be used on all reserve pits as deemed appropriate by the BLM.

Approximately 630,000 gallons of water would be used during the drilling of each well. This water would primarily be obtained from four existing water supply wells in the CBGA (i.e., Permit Nos. 91509, 91510, 91511, and 92093 [WSEO 1993]) (Map 2.2). These wells range in depth from approximately 1,100 to 9,900 ft. Water would be trucked or piped to individual well locations, depending upon site-specific conditions, disturbance, and time of year. Water pipelines would be temporary and would consist of standard 3 to 6 inch diameter aluminum sections laid on the surface and removed upon completion of drilling operations. Additional water supply wells would be drilled as needed during field development, and all new water wells would be permitted with the WSEO. Only minimal amounts of surface water or groundwater from shallow aquifers may be used for the project. Supplemental water may be obtained from Wamsutter or Baggs.

When the reserve pit is no longer required, water would be evaporated or solidified and the pit backfilled, as approved by the BLM. All reserve pit solidification procedures using flyash or other BLM-approved materials would be approved by the WDEQ prior to implementation. If necessary under special, unanticipated circumstances, reserve pit contents would be removed and disposed of at an appropriate facility in a manner commensurate with all relevant state and federal regulations and stipulations. The reserve pit area would be recontoured and reseeded within two years of completion of drilling and testing operations.

Human waste generated at well locations would be collected in approved waste facilities (i.e., standard portable chemical toilets), and regularly transported to approved disposal sites. Each well location would be provided with one or more such facilities during drilling and completion operations. Nonhuman waste would be collected and disposed of at approved sites.

2.1.2.4 Completion and Testing

Well completion and testing operations entail:

- Casing and cementing various segments of the well bore to protect fresh water aquifers by running steel pipe into the open borehole and cementing the pipe into place at several locations (Figure 2.3). Near-surface, fresh water aquifers are protected by surface casing which is set at the start of drilling operations.
- Perforating the casing adjacent to the formation of interest.
- Fracture stimulating (fracturing) the target formation.
- Conducting postfracturing flow tests and cleanup.

The primary purposes of production casing cementing are to prevent condensates, gas, and/or water leakage or movement from reservoir to reservoir and to isolate producing zones thereby protecting all other zones penetrated by the well

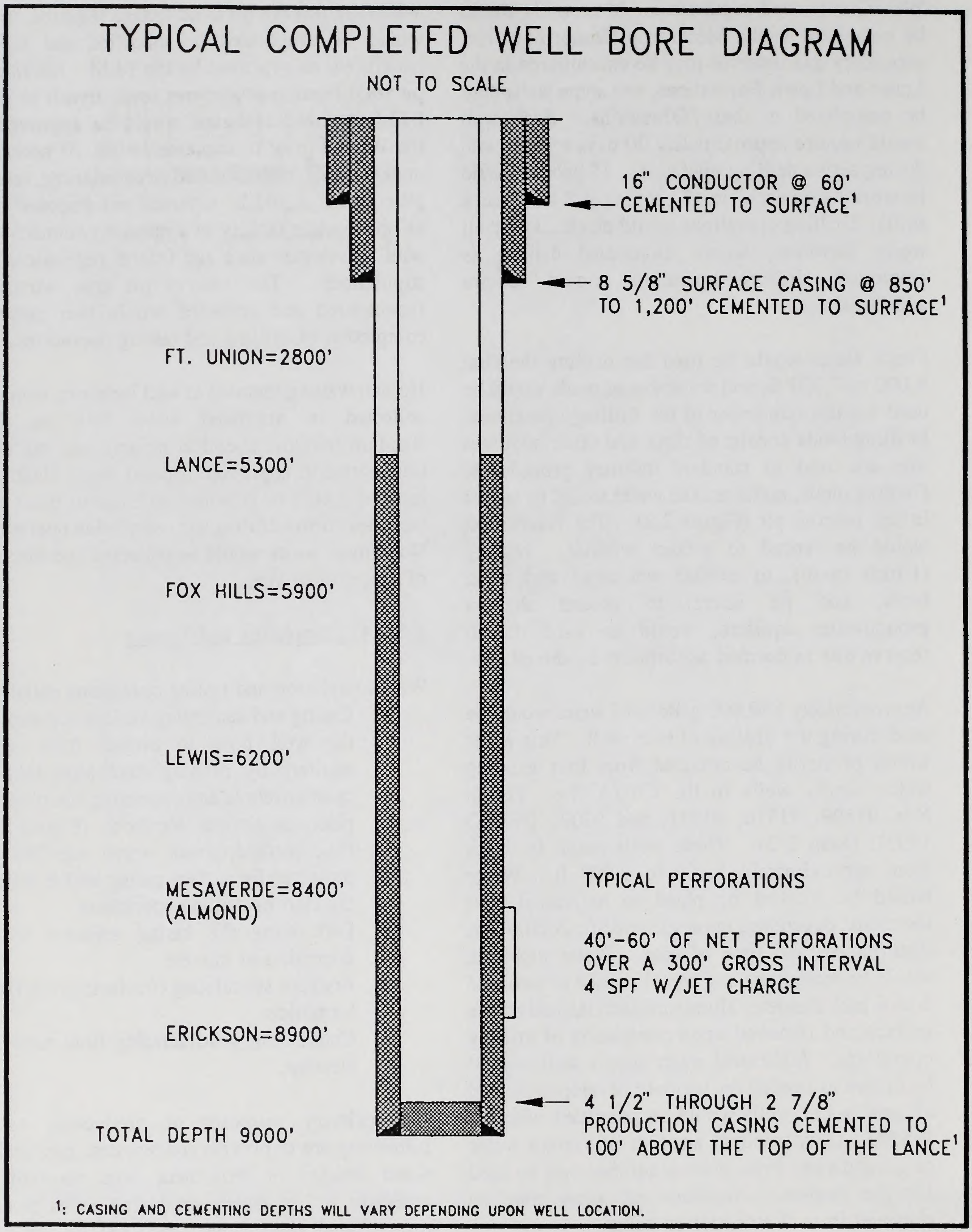

TYPICAL COMPLETED WELL BORE DIAGRAM
NOT TO SCALE
16" CONDUCTOR @ 60'
CEMENTED TO SURFACE¹
8 5/8" SURFACE CASING @ 850'
TO 1,200' CEMENTED TO SURFACE¹
FT. UNION=2800'
LANCE=5300'
FOX HILLS=5900'
LEWIS=6200'
MESAVERDE=8400'
(ALMOND)
TYPICAL PERFORATIONS
40'-60' OF NET PERFORATIONS
OVER A 300' GROSS INTERVAL
4 SPF W/JET CHARGE
ERICKSON=8900'
TOTAL DEPTH 9000'
4 1/2" THROUGH 2 7/8"
PRODUCTION CASING CEMENTED TO
100' ABOVE THE TOP OF THE LANCE¹
¹: CASING AND CEMENTING DEPTHS WILL VARY DEPENDING UPON WELL LOCATION.
1061\COMPLETE

Figure 2.3 Typical Completed Well Bore Diagram Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

(i.e., usable water zones, lost circulation zones, abnormally pressured zones, and potentially valuable mineral deposits). A typical completed (cased) well bore diagram is shown in Figure 2.3. Wells would be cased and cemented as directed and approved by the BLM (for federal minerals) and WOGCC (for state and patented minerals). Employment and traffic requirements necessary for completion operations are presented in Tables 2.2 and 2.3, respectively. Following the casing and cementing of the well bore, the rig used to drill the well would be replaced with a smaller service rig. The well casing would then be perforated in the Mesaverde Group, and the well would be prepared for fracturing. Completion and testing operations would be similar for all wells; however, additional time would be required for casing and cementing at locations with multiple wells.

Hydraulic fracturing is expected to be performed at all wells to augment gas flow rates from the Mesaverde Group. Fracturing increases gas flows by increasing formation permeability. During fracturing, fresh water or other fluids are pumped under pressure down the well bore and out through perforations in the casing into the formation. The pressurized fluid enters the formation and induces hydraulic fractures. Sand grains, bauxite pellets, or similar materials, called "proppants," are carried in suspension by the fluid into the fractures. When the pressure is released at the surface, a portion of the fracturing fluids would be forced to the well bore and up into a 16,800 gallon tank temporarily sited at the location. Fractures would partially close on the proppants, leaving channels for gas and liquids to flow into the well bore. The fracturing fluids would then be transferred to the reserve pits and evaporated or hauled away from the location and disposed of at an authorized facility; decisions regarding the appropriate disposal of fracturing fluids would be made by the BLM on a case-by-case basis. No fracturing fluids would be placed in unlined reserve pits. Following fracturing, the well would be tested by measuring gas flow rates from the well. Produced gas would be vented or flared into the flare pit during testing operations (Figure 2.2), pursuant to BLM/WOGCC rules and regulations (NTL-4A).

Approximately 84,000 gallons of water per well would be needed during completion and testing operations for fracturing and logging; the total per well water requirement for all drilling, completion, and testing operations would be 714,000 gallons; 196,350,000 gallons (602.5 acre feet) would be required for the entire 275 well proposed action.

Typical completion and testing operations would require approximately eight days and from three to five people. A maximum of 30 people would be present during fracturing operations.

2.1.2.5 Production Facilities

Once a well has been tested and deemed to be commercially productive, it would be equipped for production. When necessary, smaller diameter tubing would be placed in the well to enhance the flow of gas and liquid hydrocarbons (i.e., condensates) to the surface. Figure 2.4 is a facility schematic of a typical single well production facility. Multiple well location production facilities would not vary significantly from that shown for a single well facility. All aboveground production facilities at each location would be appropriately located and painted with standard colors (e.g., Carlsbad Canyon Brown) in order to blend with the surrounding landscape.

A series of valves at the well head (i.e., the "christmas tree") designed to control pressures and regulate gas and condensate flows from the well would be installed at the top of the casing. Pressure gauges would be installed on the christmas tree to monitor casing and tubing pressures.

The gas would pass through the christmas tree to a production unit. Gas from wells in the CBGA contains condensates and small amounts of water that must be removed from the gas stream before it enters the sales pipeline. In most instances, fuel-gas-fired production units would be used at

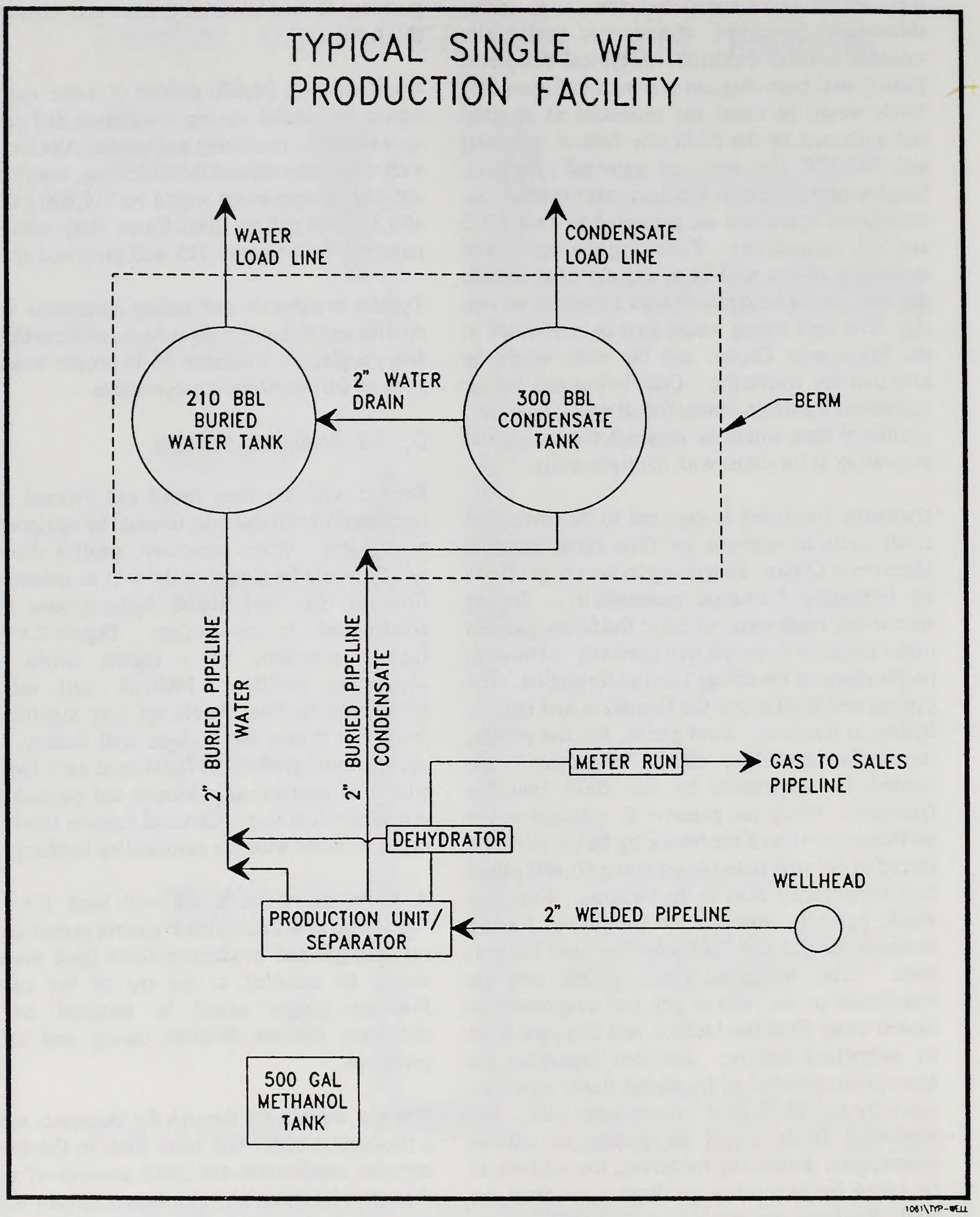


Figure 2.4 Typical Single Well Location Production Facility Schematic, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

each well location to separate natural gas, condensates, and free water from the gas stream. Molecular water would then be separated from the gas stream using glycol dehydration. Condensates and water would be diverted to separate storage tanks, and the gas would be diverted to a sales pipeline (Figure 2.4). In selected areas (e.g., Barrel Springs) a centralized facility receiving unseparated gas streams from a number of well locations may be employed. Well products would be separated and distributed at the centralized facility in the same manner as at individual well locations.

Natural gas production from CBGA wells is anticipated to range from 0.03 to 2.0 million cubic feet per day (mmcfd) and average approximately 0.4 mmcfd. The composition of two gas samples taken from the CBGA is presented in Table 2.4. Gas from the Mesaverde Group consists predominantly of methane with some ethane, propane, carbon dioxide (CO_2), and other gases. The gas does not contain hydrogen sulfide (H_2S), so H_2S emissions are not expected.

The volume of condensate production from CBGA wells is anticipated to range from 0 to 15 barrels per day (bpd) and would likely average approximately 6 bpd from most wells. Condensates consist primarily of long chain hydrocarbon liquids (e.g., heptanes, octanes) and would be stored in tanks at well locations and centralized facilities. All tank batteries would be fenced and bermed to contain the entire storage capacity of the largest tank plus one foot of freeboard. Condensates would be periodically removed from storage tanks and transported by truck off the CBGA for sale to refineries.

Produced water from CBGA wells is anticipated to range in volume from 0 to 15 bpd and would likely average 4 bpd. Table 2.5 presents information on the quality of produced water samples collected from four wells on the CBGA. Produced water quality on the CBGA is variable and would be monitored periodically throughout the LOP. Produced water would be stored in tanks at well locations and centralized facilities and would periodically be removed and transported by truck to the existing, permitted Mexican Flats water disposal facility (see Section 2.1.2.7) or other permitted disposal facilities. The Mexican Flats facility is currently operating at less than 50% capacity, and the facility's total capacity can be increased by 30% without additional disturbance; therefore, it is anticipated that the facility can handle the disposal of the additional water produced by this project. Where applicable, National Pollutant Discharge Elimination System (NPDES) permits would be obtained from the WDEQ, and produced water that meets applicable discharge standards would be discharged to the surface at appropriate locations. Produced water would not be discharged in areas where it may adversely affect big game distribution on crucial winter range.

2.1.2.6 Pipelines

Gas produced from wells would be transported from each location through newly constructed pipelines linking well locations to existing or newly constructed natural gas gathering systems present in the CBGA. A larger gas sales pipeline would deliver gas from gathering system lines to existing interstate gas transportation pipelines. While it is not currently possible to identify the specific locations of proposed pipeline routes, tentative locations are shown on Map 2.2. Industry standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of pipelines to ensure the safety and efficiency of pipelines in the CBGA. Pressure testing would be used to ensure pipelines are intact. All necessary authorizing actions for natural gas pipelines would be addressed prior to installation.

Approximately 115 mi of new pipeline (0.46 pipeline miles per location) and 166 mi of existing pipeline on the CBGA would be required for the proposed action. New pipelines would be 2 to 6 inches in diameter and buried to depths ranging from 4 to 6 ft. All newly constructed

Table 2.4 Gas Composition Data, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

	Percent by Weight		
Parameter	Sample 1	Sample 2	Average
Methane	85.82	86.14	85.98
Ethane	6.76	7.11	6.94
Carbon dioxide	3.35	2.95	3.15
Propane	2.31	2.50	2.40
N-Butane	0.55	0.48	0.52
I-Butane	0.48	0.43	0.46
Nitrogen	0.29	0.22	0.25
I-Pentane	0.19	0.09	0.14
N-Pentane	0.19	0.07	0.13
Hexanes	0.06	0.01	0.03
Total	100.00	100.00	100.00

pipelines would be located to minimize surface disturbance and maximize construction and gas transport efficiency. The maximum width of pipeline ROWs and disturbance areas would be 50 ft. Where possible, ROWs for newly constructed pipelines would parallel and utilize some portion of existing pipeline and road ROWs to reduce surface disturbance (Figure 2.1).

Sufficient topsoil to facilitate reclamation would be removed from pipeline ROWs before construction. However, ROWs which do not require major excavation may be stripped of vegetation to ground level (scalped) using mechanical treatments, leaving topsoil intact and root masses relatively undisturbed. Scalping operations would facilitate vegetation reestablishment. All pipeline ROWs would be reclaimed as soon as practical after construction.

Pipeline construction crews consisting of approximately six persons would install an average of 850 ft of line per day (Table 2.2), and each pipeline segment (0.46 mi) would require approximately three days to construct.

2.1.2.7 Ancillary Facilities

The proposed action would utilize existing compression, treatment, and water disposal facilities, powerlines, and existing water wells to the maximum extent possible. No additional powerline construction is anticipated for the proposed project. The increased gas supplies resulting from the proposed action would require some expansion of existing compressor/treatment stations; no expansion of the 6.0 acre Mexican Flats water disposal facility is anticipated (Map 2.2). The existing Barrel Springs compression/dehydration facility occupies a fenced site of approximately 11.0 acres, whereas the Blue Gap compression facility occupies a fenced location of approximately 8.0 acres. The expansion of these two facilities would not require additional disturbance outside of existing fenced facility sites. Additional potential treatment and

Table 2.5 Produced Water Quality Data from Four Mesaverde Group Wells and Relevant WDEQ Class III Groundwater Quality Standards, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Water Quality Parameter	WDEQ Class III Water Quality Standard	CBGA Wells[2]				
		BSU 20-6	CIGE 25-14	Puckett 11-14	BSU 30-1	Average
Arsenic	0.2	<0.002	–	<0.002	<0.002	<0.002
Bicarbonate	–	14.0	1,394.0	2,049.0	4,414.0	1,967.8
Chloride	2,000.0	57.0	1,028.0	4,660.0	718.0	1,615.8
Conductivity (umhos/cm)	–	214.0	4,661.0	12,805.0	9,329.0	6,752.2
pH (standard units)	6.5-8.5	4.7	6.8	6.0	8.1	6.4
Potassium	–	1.0	12.0	54.0	19.0	21.5
Selenium	0.05	<0.005	–	<0.005	<0.005	<0.005
Sodium	–	99.0	1,247.0	3,481.0	2,312.0	1,784.8
Total dissolved solids (TDS)	5,000.0	171.00	3,729.0	10,244.0	7,463.0	5,401.8

[1] Adapted from WDEQ (1990) and various laboratory analyses (EPA methods SW-846, 600). All values reported in mg/l unless otherwise indicated.

[2]

Well No.	Location	Approximate Perforation Depth (ft)
BSU 20-6	NE¼, Sec. 6, R93W, T16N	9,300 - 9,700
CIGE 25-14	SW¼, Sec. 25, R93W, T14N	10,300 - 10,900
Puckett 11-14	SW¼, Sec. 11, R92W, T14N	7,900 - 8,600
BSU 30-1	SW¼, Sec. 1, R93W, T16N	8,300 - 8,700

compression facilities will likely be required during project development; however, their necessity would be determined by pipeline system hydraulics which cannot currently be identified. At present, one additional compression facility (8.0 acres) is anticipated for the proposed project and is analyzed as part of the proposed action. While no new water wells beyond those currently existing in the CBGA are anticipated, some additional wells may be developed. For the purpose of impact assessment in this EIS, all lands contained within fenced facility sites are considered as existing disturbance and are analyzed as part of the proposed action.

2.1.2.8 Geophysical Operations

Data from numerous seismic operations conducted under BLM guidelines and approvals are available for the CBGA. Additional seismic survey data from three-dimensional surveys, velocity surveys, normal incident vertical seismic profiles, and/or offset vertical seismic profiles may be required in the CBGA during the LOP. These surveys would cause minimal surface disturbance and Class III cultural resource inventories would be conducted prior to survey implementation. It is premature to determine whether any seismic survey data would be acquired during the development of this project; however, some surveys may be conducted. Any seismic surveys conducted as a result of this project would be implemented using procedures specified in the BLM's Great Divide Resource Area RMP (BLM 1987:455-458) after receipt of BLM and/or WOGCC approval.

2.1.2.9 Hazardous Materials

As mandated under BLM Instruction Memoranda Nos. WO-93-344 and WY-94-059, all NEPA documents must list and describe any hazardous or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. Hazardous materials are those chemicals listed in the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*; extremely hazardous materials are those defined in 40 CFR 355. Hazardous materials anticipated to be used or produced during the implementation of this proposed action fall into the following categories:

- fuels - gasoline (potentially containing benzenes, toluene, xylenes, methyl-tert-butyl ether, and tetraethyl lead), diesel fuel, and natural gas (Table 2.4);
- combustion emissions - nitrogen oxides (NO_x), carbon monoxide (CO), and nonmethane hydrocarbons (NMHCs);
- lubricants - grease (potentially containing complex hydrocarbons and lithium compounds) and motor oil;
- well production products - natural gas (Table 2.4) and condensates (primarily long-chain hydrocarbons including pentane, heptane, octane, nonane, etc.);
- produced water - containing small quantities of potentially hazardous substances (e.g., chlorides, sulfates, heavy metals, and radionuclides) (Table 2.5);
- antifreeze and dehydration agents - ethylene glycol and triethylene glycol;
- drilling fluids - caustic soda (sodium hydroxide), barium compounds (e.g., barium sulfate);
- fracturing fluids - biocides (e.g., thiazolin compounds), aqueous foaming agents (methanol, oxyalkylated alkyl phenol, ethylene glycol monobutyl); and
- cement additives.

Further, specific information regarding the types and quantities of hazardous materials, as well as their production, use, storage, transport, and disposal for the proposed project, will be provided in the Hazardous Materials Management Plan for the proposed project. This plan will be presented as an appendix to the FEIS for this project, and will be available upon request from the BLM Great Divide Resource Area and Rawlins District Offices in June 1994.

No extremely hazardous materials (40 CFR 355) are presently anticipated to be produced, used, stored, transported, or disposed of as a result of the proposed project; however, some extremely hazardous materials may be present in combustion emissions (e.g., nitrogen dioxide) and produced water. Combustion emissions would be regulated by the WDEQ Air Quality Division (WDEQ-AQD) and would not exceed authorized limits. Produced water would be disposed of at the Mexican Flats evaporation ponds or other permitted facilities in accordance with all applicable BLM, WOGCC, and WDEQ Water Quality Division (WDEQ-WQD) rules and regulations (see Section 2.1.2.5).

All production, use, storage, transport, and disposal of hazardous materials as a result of this project would be in strict accordance with federal, state, and local government regulations and guidelines. Notice of any spill or leakage (i.e., undesirable event), as defined in BLM NTL-3A, would be immediately given by SOCO or other area operators to the Authorized Officer and other such federal and state officials as are required by law. Any oral notice shall be confirmed in writing within 72 hours of any such occurrence. SOCO's *Spill Prevention Control and Countermeasure Plan* for the Barrel Springs Unit is provided in Appendix B.

2.1.3 Operations and Maintenance

2.1.3.1 Maintenance

All wells, pipelines, and associated ancillary production facilities would be operated in a safe manner according to standard industry operating procedures. Routine maintenance of the producing wells would be necessary to maximize performance and detect potential difficulties. Each well location would typically be visited every other day to ensure operations are proceeding efficiently. This visit includes, but is not limited to, checking separators, gauges, valves, fittings, and on-site storage of produced water and condensates. Routine on-site equipment maintenance would also be performed as necessary. Additionally, all roads and well locations would be regularly inspected and maintained to minimize erosion and assure safe operating conditions.

2.1.3.2 Workovers

Well workovers, to ensure well bore integrity and maximize gas flows by cleaning out the well bore, usually involve utilizing a rig similar to that used for completion procedures. On the average, workovers or other routine well bore maintenance work would occur once every 10 years for each well. The duration of workover activities is dependent upon the nature of the work being conducted but is typically about 10 days. Approximately seven people would be on site during workovers (Table 2.2), and approximately 10 round trips would be required per workover (Table 2.3). Workovers would predominantly be conducted during daylight hours, and the BLM would be consulted prior to initiating workovers in crucial wildlife areas during critical periods.

2.1.4 Reclamation and Abandonment

Reclamation would be conducted on all disturbed areas in compliance with the BLM *Wyoming Policy on Reclamation* (BLM 1990b). Erosion Control, Restoration, and Revegetation Plans (ERRPs) would be prepared by area operators on a site-specific basis during the APD and ROW application processes. ERRPs are generally included as components of APDs and ROW applications, and associated Surface Use Plans and Plans of Development. ERRPs would be reviewed and approved by the BLM prior to the authorization of construction/development activities (i.e., site disturbance). The short-term reclamation goal would be to stabilize disturbed areas as rapidly as possible thereby protecting sites and adjacent undisturbed areas from degradation. The long-term goal would be to return the land to conditions approximating those which existed prior to disturbance.

Reclamation would occur during two phases of the proposed project. Initially, well locations and road ROWs would be partially reclaimed after well testing and production facilities are installed. Disturbed surface areas along pipeline ROWs would be fully reclaimed after pipeline installation. This initial reclamation would reduce the amount of disturbed area to that necessary for production operations. Upon project completion, all remaining disturbed areas, except roads designated to remain for other purposes, would be reclaimed. In addition, all unproductive well locations and associated ROWs would be reclaimed as soon as practical. Reclaimed roads would be signed as directed by the BLM to decrease off-road travel in these areas.

After installation of production equipment, well locations for producing wells would be reduced from approximately 2.5 acres to approximately 1.5 acres, and the remaining 1.0 acre would be reclaimed. Drilling and other fluids contained in the reserve pits would be evaporated or solidified, and the pit would be backfilled when dry as authorized by the WDEQ and/or BLM. If necessary, reserve pit contents would be removed and disposed of at an authorized location. The unused portion of the well location would be recontoured and reseeded within two years of initial disturbance. Reclamation specifications, including methods, seed mixtures, etc., would be developed by SOCO and other CBGA operators in consultation with the BLM or other surface owners. Reseeding would also be performed on cut slopes and long fill slopes on both sides of all roads (9.5 ft each side) and on all pipeline ROWs outside road ROWs, thereby reducing the disturbance area for the remaining LOP.

The entire well location area and resource road for all unproductive locations would be reclaimed, according to BLM, State Land Board, or private landowner specifications. Locations determined to be unproductive would be appropriately plugged and fully reclaimed as soon as possible after testing. A typical plugged and abandoned well bore schematic is shown in Figure 2.5. All plugging procedures would adhere to specifications presented in BLM Onshore Oil and Gas Order No. 2 (43 CFR 3164) and/or WOGCC rules and regulations (WOGCC 1991).

At the end of the project's useful life (estimated at 30 to 50 years), SOCO and other CBGA operators would obtain all necessary authorizations from appropriate regulatory agencies and/or landowners to abandon facilities. Wells would be permanently or temporarily plugged or shut-in until decisions are reached regarding future production options. Pipelines would be purged of all combustible products and retired in place or removed, based on authorizing agency or landowner specifications. All aboveground facilities would be removed, and all unsalvageable materials would be disposed of at authorized sites. Roads would be reclaimed or left in place based on authorizing agency or landowner specifications. Reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed (i.e., 30 to 50 years from project initiation). Regrading, topsoiling, and revegetation of disturbed land areas would be completed. Abandoned ROWs would revert to the private landowner or appropriate agency control. Compacted areas would be thoroughly ripped 12 to 18 inches deep before topsoil is replaced. The proposed seed mixture (see Section 5.1) or other mixture as approved by the BLM would be broadcast or drill seeded.

2.1.5 Projectwide Mitigation Measures

SOCO and other CBGA operators propose to implement the following mitigation measures, design features, and procedures on public lands throughout the CBGA to avoid or mitigate project impacts. These mitigation measures and design features may be waived when deemed appropriate by the BLM Authorized Officer if a thorough analysis determines that the resource for which the measure was developed would not be impacted. Further site-specific mitigation measures would be identified during the APD process. To assure compliance with the mitigation measures stipulated in this EIS and in APDs, SOCO and the other CBGA operators would have a qualified individual (i.e., Environmental Compliance Coordinator) available during construction/drilling operations.

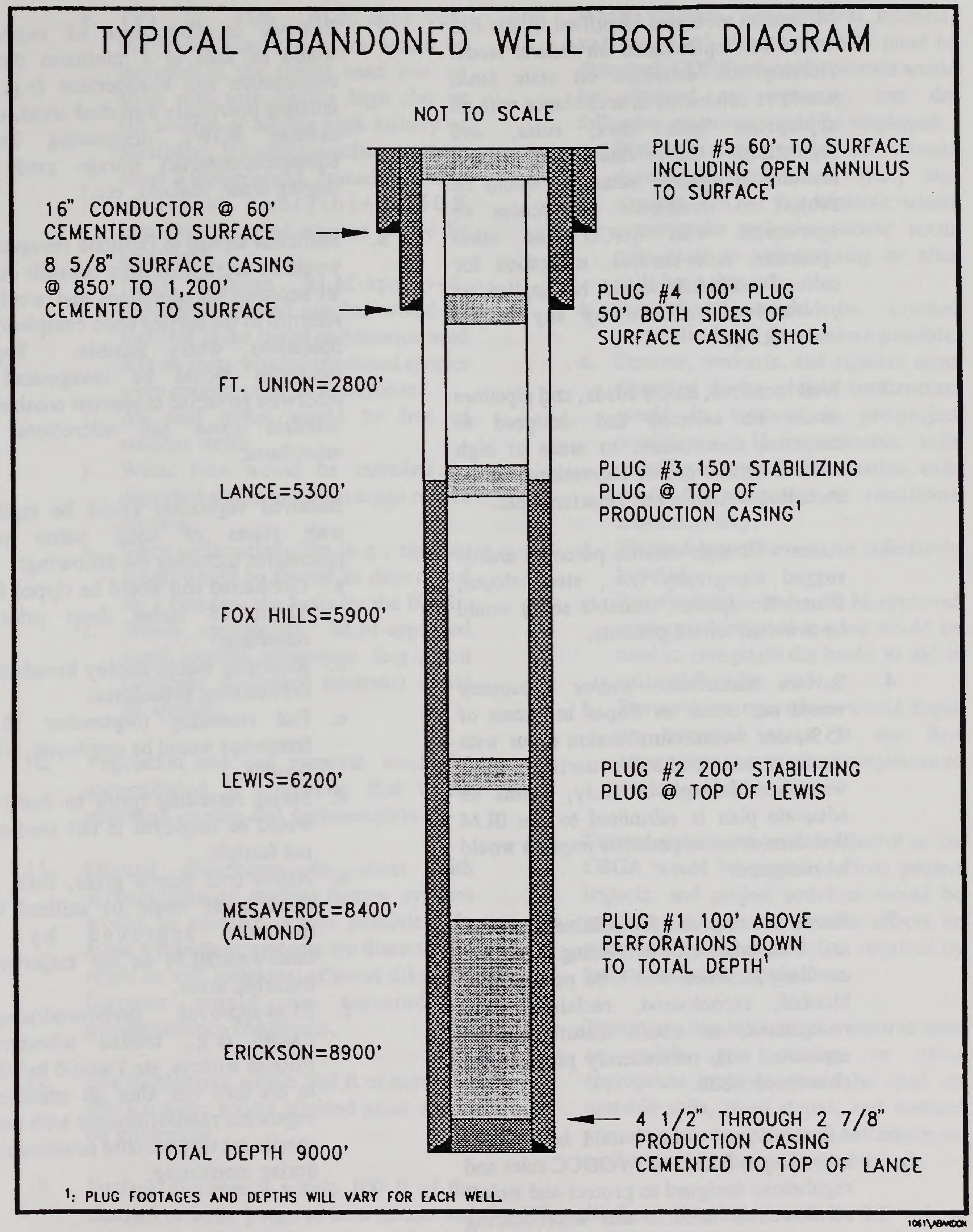

TYPICAL ABANDONED WELL BORE DIAGRAM
NOT TO SCALE
PLUG #5 60' TO SURFACE INCLUDING OPEN ANNULUS TO SURFACE¹
16" CONDUCTOR @ 60' CEMENTED TO SURFACE
8 5/8" SURFACE CASING @ 850' TO 1,200' CEMENTED TO SURFACE
PLUG #4 100' PLUG 50' BOTH SIDES OF SURFACE CASING SHOE¹
FT. UNION=2800'
LANCE=5300'
PLUG #3 150' STABILIZING PLUG @ TOP OF PRODUCTION CASING¹
FOX HILLS=5900'
LEWIS=6200'
PLUG #2 200' STABILIZING PLUG @ TOP OF ¹LEWIS
MESAVERDE=8400' (ALMOND)
PLUG #1 100' ABOVE PERFORATIONS DOWN TO TOTAL DEPTH¹
ERICKSON=8900'
4 1/2" THROUGH 2 7/8" PRODUCTION CASING CEMENTED TO TOP OF LANCE
TOTAL DEPTH 9000'
¹: PLUG FOOTAGES AND DEPTHS WILL VARY FOR EACH WELL.
1061\ABANDON

Figure 2.5 Typical Abandoned Well Bore Diagram, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

1. Mitigation measures identified in this EIS would be implemented on federal lands. Development activities on state lands would be conducted in accordance with all appropriate state laws, rules, and regulations. On private lands, cultural resource mitigation measures would be subject to landowner preferences or agreements with SOCO and other operators; none-the-less, mitigation for cultural resources would be applied on private lands affected by any federal undertaking.

2. Well locations, access roads, and pipelines would be selected and designed to minimize disturbances to areas of high wildlife habitat and/or recreational value, including wetlands and riparian areas.

3. Areas with high erosion potential and/or rugged topography (i.e., steep slopes, dunes, floodplains, unstable soils) would be avoided, where possible.

4. Surface disturbance and/or occupancy would not occur on slopes in excess of 25%, nor would construction occur with frozen or saturated soil material or when watershed damage is likely, unless an adequate plan is submitted to the BLM that demonstrates potential impacts would be mitigated.

5. Roads not required for routine operation and maintenance of producing wells and ancillary facilities would be permanently blocked, recontoured, reclaimed, and revegetated, as would disturbed areas associated with permanently plugged and abandoned wells.

6. All abandoned wells would be plugged according to BLM and WOGCC rules and regulations designed to protect and isolate all downhole mineral and water-bearing zones.

7. Removal or disturbance of vegetation would be kept to a minimum through construction site management (e.g., by utilizing previously disturbed areas, using existing ROWs, designating limited equipment/materials storage yards and staging areas, scalping, etc.).

8. Sufficient topsoil to facilitate revegetation would be segregated from subsoils during all construction operations and would be returned to the surface upon completion of operations, where feasible. Topsoil stockpiles would be revegetated or otherwise protected to prevent erosion and maintain some soil microflora and microfauna.

9. Removed vegetation would be replaced with plants of equal value using procedures including the following:
    a. Compacted soil would be ripped from 12 to 18 inches deep prior to reseeding.
    b. Reseeding would employ broadcast or drill seeding procedures.
    c. Fall reseeding (September 15 to freeze-up) would be employed, where feasible.
    d. Spring reseeding (prior to April 15) would be employed if fall seeding is not feasible.
    e. Native cool season grass, forb, and shrub seeds would be utilized in a mixture approved by the landowner/BLM on the majority of disturbed areas.
    f. BLM-approved introduced/adapted species (e.g., crested wheatgrass, Russian wildrye, etc.) would be added to the seed mix after all attempts at vegetation reestablishment with native species are unsuccessful as determined during monitoring.

g. Ten to 25% BLM-approved, introduced/adapted species would be included in the initial seed mix on areas with soils having high clay or silt content or having high salinity or alkalinity. If initial reseeding on these areas is unsuccessful, reseeding with a mixture containing 50% introduced/adapted species would be employed.
h. Fifty percent BLM-approved, introduced/adapted species would be included in the initial reclamation seed mix on areas where introduced species were present prior to disturbance.
i. All seed mixes would be free of noxious weeds.
j. Water bars would be installed on disturbed slopes as necessary to reduce erosion.
k. Some reclamation sites (e.g., riparian areas) would be fenced as determined on a case-by-case basis by the BLM.
l. Where appropriate, BLM-approved weed control techniques (e.g., soil sterilants, biological controls) would be applied.

10. Vegetation and soil removal would be accomplished in a manner that would minimize erosion and sedimentation.

11. Ground disturbance in areas with spreader-dike or contour furrow systems would be avoided, where possible. In areas where these systems are dissected by roads or well locations, affected dikes and furrows would be restored to pre-disturbance conditions.

12. Soil disturbance within 500 ft of perennial surface water and/or wetland areas would be minimized.

13. Surface disturbance within 100 ft of the channel or inner gorge of intermittent and ephemeral drainages would be minimized.

14. Where wetlands, riparian areas, streams, and ephemeral stream channels must be disturbed, COE Section 404 permits would be obtained as necessary, and the following measures would be employed:
a. Wetland areas would be crossed during dry conditions (i.e., late summer, fall, or dry winters); winter construction activities would occur only prior to soil freezing or after soils have thawed.
b. Streambeds would be crossed perpendicular to flow, where possible.
c. Streams, wetlands, and riparian areas disturbed during project construction would be restored to pre-project conditions. If impermeable soils contributed to wetland formation, soils would be compacted to reestablish impermeability.
d. Wetland topsoil would be selectively handled.
e. Recontouring and BLM-approved appropriate/adapted species would be used to revegetate the banks to aid in soil stabilization.
f. Revegetation operations would begin on impacted areas in the first appropriate season after completion of project activities.

15. Current water uses on and adjacent to the CBGA would be protected from project impacts, and project activities would be conducted to prevent adverse effects on water quality and quantity, as required by federal and state regulations.

16. Temporary erosion control measures such as mulch, jute netting, or other appropriate methods would be used on unstable soils, steep slopes, and wetland areas to prevent erosion and sedimentation until vegetation becomes established.

17. Surface disturbance within 0.5 mi of active raptor nest sites (i.e., used within the last three years) would be avoided

during the nesting season of February 1 through July 31. If the area must be impacted, project activities would occur outside the nesting season.

18. Construction and drilling activities on crucial winter range as delineated by the BLM and WGFD would not be allowed during crucial winter periods from November 15 through April 30. Proposed wells, roads, and pipelines located within crucial winter range would be scheduled for development during the spring, summer, or fall months.

19. Known active sage grouse leks and adjacent public land areas (2.0 mi radius from lek centers) would be avoided during the breeding and nesting seasons from March 1 through June 30; no construction activities would be conducted on public lands within 0.25 mi of known lek sites. Project activities on public lands other than routine production and well maintenance would only occur within 2.0 mi of lek centers outside the breeding and nesting seasons.

20. Reserve pits and other areas potentially hazardous to wildlife would be fenced and/or netted (1 inch mesh) to prohibit wildlife access as directed by the BLM.

21. Paleontological and archaeological field checks by BLM personnel or other authorized personnel would occur prior to disturbance as deemed appropriate by the BLM. Monitoring during surface-disturbing activities would be conducted by a BLM-approved archaeologist or paleontologist, as deemed appropriate by the BLM. Paleontological or cultural resource sites would be avoided or mitigated as necessary prior to disturbance. Any cultural or paleontological resource discovered by an operator or any person working on his behalf would be immediately reported to the BLM, and all operations that may further disturb such resources shall be suspended until written authorization to proceed is issued by the BLM Authorized Officer. An evaluation of the discovery would be made by the BLM to determine appropriate actions to prevent the loss of significant resources.

22. Construction and facilities would be in conformance with Visual Resource Management (VRM) objectives for the VRM classes on the project area. All surface facilities on the CBGA would be located to minimize disturbance of the visual horizon and painted to blend in with the surrounding landscape.

23. Noise disturbance on the CBGA would be minimized by keeping all internal combustion engines adequately muffled and maintained.

2.2 OTHER ALTERNATIVES

2.2.1 Alternative 1 - 175 Locations/200 Wells

The future performance of wells proposed on the CBGA may indicate that fewer locations/wells would be required to adequately ensure the optimal recovery of natural gas. Therefore, one alternative to the proposed action (i.e., Alternative 1) is the development of 175 locations (200 wells). This could potentially result in a lengthened LOP--40 to 50 years--since well spacing patterns in some areas may be less dense and additional time may be required to adequately recover natural gas reserves.

Project activities as described in the proposed action would be essentially the same under implementation of Alternative 1 except project impacts would be reduced by approximately 30% (Table 2.1). One hundred and seventy-five well locations (200 wells), 28 mi of new road, and 81 mi of new pipeline would be developed, and approximately 1,186 acres of existing disturbance from roads, pipelines, and ancillary facilities would be utilized under Alternative 1. Ancillary facility use and expansion would be the same as for the proposed action. The total number of person-years required for project development and implementation would decrease by approximately 25% from that anticipated under the proposed action (Table 2.2), assuming the LOP is increased by 10 years. Mitigation measures as described for the proposed action would also be applied under Alternative 1.

2.2.2 Alternative 2 - 300 Locations/330 Wells

Reservoir performance may indicate the need for closer well spacing in some areas of the CBGA to ensure optimal gas recovery. Therefore, another alternative to the proposed action (i.e., Alternative 2) would involve gas well development in some areas of the CBGA on an 80 acre spacing pattern (300 total well locations/330 total wells). Under this alternative, gas would likely be recovered in approximately 20 to 30 years.

As with Alternative 1, project activities as described in the proposed action would be essentially the same under implementation of Alternative 2. Project impacts under Alternative 2 would be increased by approximately 20% (Table 2.1). Three hundred well locations (330 wells), 48 mi of new road, and 138 mi of new pipeline would be developed for Alternative 2. Approximately 2,028 acres of existing disturbance from roads, pipelines, and ancillary facilities would be utilized under Alternative 2, and ancillary facilities would be expanded to the same extent as indicated for the proposed action. The total number of person-years required for project development and implementation would increase by approximately 15% from that anticipated under the proposed action (Table 2.2), assuming the LOP is decreased by approximately 10 years. Mitigation measures as described for the proposed action would also be applied under Alternative 2.

2.2.3 No Action

NEPA requires that a "no action" alternative be considered in all environmental documents. For the Creston/Blue Gap Natural Gas Project, the no action alternative would deny further development of SOCO's and other operators' proposed action and alternatives, including drilling operations and construction of roads and pipelines. The denial of the right to fully develop the subject lease could void the lessees' contractual rights and the natural gas resource would not be extracted and utilized.

An oil and gas lease grants the lessee the "right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (BLM Form 3100-11). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms (see *Copper Valley Mach. Works, Inc. v. Andrus*, 474 F. Supp. 189, 191, DDC 1979, 653 F.2d 595, DDC 1981, and *Natural Resource Defense Council v. Bergland*, 458 F. Supp. 925, 937, DDC 1978). On land leased without a No Surface Occupancy stipulation, the USDI cannot deny the permit to drill but can impose mitigation measures upon a lessee who pursues surface-disturbing exploration and/or drilling activities only if unnecessary or undue environmental degradation will occur (see *Sierra Club v. Peterson*, 717 F.2d 1409, 1983). In the absence of a No Surface Occupancy stipulation covering the entire lease, restrictions based on oil and gas lease operations must be "reasonable." They cannot directly or indirectly prohibit, altogether, the development of the lease. Although a given APD can be denied, the right to drill and develop somewhere on the leasehold cannot be denied by the USDI. To deny all activity would constitute a breach of contract of an operator's rights to conduct development activities on the leased lands. Authority for complete denial can be granted only by Congress (which can order the leases forfeited subject to compensation) (*Union Oil Company of California v. Morton*, 512 F.2d 743, 750-51, 9th Cir. 1975). The USDI, therefore, could only suspend the lease pursuant to Section 39 of the Mineral Leasing Act pending consideration by the Congress of a grant of authority to preclude drilling and provide compensation to the lessees.

Most leases in the CBGA contain various stipulations addressing surface disturbance, steep slopes, wildlife, and other matters of concern (Appendix A). These stipulations would allow the USDI to preclude operations in certain areas (e.g., where slopes exceed 25%) or at certain times of the year (e.g., to protect pronghorn crucial winter habitat) if operations cannot be acceptably mitigated. However, there is no stipulation, such as a No Surface Occupancy stipulation, that would allow the USDI to preclude drilling operations everywhere on a lease at all times of the year. If any one of the stipulations cannot be acceptably implemented and impacts mitigated, then an exception would not be granted. A decision, therefore, of "no action," as authorized by the leases, would be considered, given one of the following conditions:

- If there were no acceptable means of mitigating significant adverse impacts to the stipulated surface resource values, then this would trigger denial of the APD and require consideration and analysis of another alternative(s). Effectively, exception(s) to one or more of the lease stipulations would not be approved.
- If the USFWS concluded that the proposed action and alternatives would be likely to jeopardize the continued existence of any endangered or threatened plant and animal species, then the APD and lease development may be denied in whole or in part.

This EIS will help to determine whether the proposed action meets any of these conditions.

2.3 ALTERNATIVES CONSIDERED BUT REJECTED

Increased well density alternatives were examined during initial project design, but known characteristics of the gas reservoir, and economic and environmental considerations are such that denser spacing patterns (e.g., 40 acres) are not feasible and were, therefore, rejected. Spacing at greater distances with fewer total wells (e.g., 640, 320 acres) was also considered but rejected because it would not efficiently drain gas reserves in the targeted formation and impacts to resources would not be reduced proportionally since many of the roads are necessary regardless of the number of wells drilled.

2.4 SUMMARY OF ENVIRONMENTAL IMPACTS

A summary of impacts and mitigations for the proposed action (250 locations/275 wells), Alternative 1 (175 locations/200 wells), Alternative 2 (300 locations/330 wells), and no action is presented in Table 2.6. Further details on impacts and mitigation measures of the proposed action and the alternatives are presented in Chapters 4.0 and 5.0.

Table 2.6 Summary of Impact Analysis for the Proposed Action, Alternatives 1 and 2, and No Action, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	Alternative 1	Alternative 2	No Action	Mitigation(s)
AIR QUALITY					
Airborne particulates and emissions increase but remain within state and federal standards	Negligible to moderate - small increases in dust and emissions adjacent to well locations, roads, and ancillary facilities; LOP	Negligible to moderate and reduced by approximately 30% from proposed action	Negligible to moderate but increased by approximately 20% from proposed action	No impact	Acquisition of appropriate air quality permits from WDEQ; regular maintenance of roads and equipment.
TOPOGRAPHY/PHYSIOGRAPHY					
Cuts and fills at well locations and along roads	Negligible - no major landscape alterations; site-specific; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of significant features.
Alteration of surface drainages	Negligible - no long-term modifications to drainages; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of drainages where possible; reestablishment and reclamation of drainages; appropriate road and culvert design; acquisition of 404 permits as appropriate.
MINERALS/GAS AND OIL					
Depletion of gas and condensate reserves	Significant; near 100% depletion of reserves in Mesaverde Group; permanent	Same as proposed action	Same as proposed action	Significant; violation of lease agreements	None.
Localized temporary loss of access to mineral reserves	Negligible - no active coal or uranium mining; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of gravel quarry, and potential future coal and uranium mine sites, where possible.
GEOLOGIC HAZARDS					
Flood damage to pipelines and facilities	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of floodplains and flood prone areas, where possible.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	**Alternative 1**	**Alternative 2**	**No Action**	**Mitigation(s)**
		GEOLOGIC HAZARDS (Continued)			
Reactivation of dunes due to ground cover removal	Moderate to significant; LOP	Moderate to significant; reduced by approximately 30% from proposed action	Moderate to significant; increased by approximately 20% from proposed action	No impact	Avoidance of dunes where possible; appropriate and timely reclamation, erosion control, and revegetation.
Earthquake damage to pipelines and facilities	Negligible - very low earthquake potential; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Well and pipeline construction to withstand moderate earthquakes.
Land slides and slumping at construction sites	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of unstable areas where possible; appropriate and timely reclamation and erosion control.
		PALEONTOLOGICAL RESOURCES			
Disturbance/destruction of important fossils	Negligible during construction and LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance, recovery, and/or monitoring as determined during preconstruction BLM paleontological surveys, employee education.
Loss of important fossil materials due to private collection or vandalism	Negligible during construction and LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance, recovery, and/or monitoring as determined during preconstruction BLM paleontological surveys, employee education.
Discovery of previously unknown fossils	Beneficial during construction	Same as proposed action but reduced by approximately 30% from proposed action	Same as proposed action and increased by approximately 20% from proposed action	Negligible - no new fossil discovery	None.
		SOILS			
Disturbance and erosional loss of soils	Moderate during construction and LOP; 1,248 acres new initial disturbance and 558 acres new disturbance for LOP	Same as proposed action and reduced to 878 acres new initial disturbance and 393 acres of new disturbance for LOP	Same as proposed action but increased to 1,496 acres new initial disturbance and 667 acres new disturbance for LOP	No impact	Avoidance of erosion-prone areas where possible; appropriate and timely use of erosion and sedimentation control techniques/devices; adherence to ERRPs.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	Alternative 1	Alternative 2	No Action	Mitigation(s)
SOILS (Continued)					
Soil compaction and decreased productivity	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Use of appropriate reclamation techniques; restrict off-road vehicle travel.
Contamination due to accidental hazardous material spills	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Adherence to hazardous materials management and spill prevention and control countermeasure plans.
SURFACE WATER RESOURCES					
Increased turbidity, salinity, and sedimentation of surface waters due to runoff from disturbed areas	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Use of appropriate erosion and sedimentation control techniques/devices; adherence to ERRPs.
Contamination of surface waters from accidental hazardous material spills	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Adherence to hazardous materials management and spill prevention and control countermeasure plans.
Contamination of surface waters from discharge of unsuitable quality produced water	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Adherence to NPDES permit requirements; appropriate disposal of poor quality produced water.
GROUNDWATER RESOURCES					
Reduced groundwater availability from withdrawal of drilling water	Negligible - no current users; LOP and until aquifers recharged	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	None.
Contamination of groundwater from discharge of produced water, accidental hazardous material spills, and/or cross aquifer mixing through well bores	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Appropriate disposal of poor quality produced water; adherence to spill prevention and control countermeasure plans; adherence to WOGCC/BLM well drilling, casing, and abandonment requirements.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	Alternative 1	Alternative 2	No Action	Mitigation(s)
			NOISE		
Increased noise levels near residences and within crucial wildlife habitats during critical periods	Moderate during construction; negligible LOP	Moderate during construction and negligible for LOP; incidences reduced by approximately 30% from proposed action	Moderate during construction and negligible for LOP; incidences increased by approximately 20% from proposed action	No impact	Avoidance of residences; no drilling or construction activities within crucial wildlife habitats during critical periods; use of equipment mufflers.
			ODOR		
Presence of offensive odors proximal to facilities and roads	Negligible; LOP	Negligible and incidences reduced by approximately 30% from proposed action	Negligible but incidences increased by approximately 20% from proposed action	No impact	Regular equipment maintenance.
			VEGETATION		
Removal of vegetation	Negligible - 1,248 acres new initial disturbance and 558 acres new for disturbance LOP	Same as proposed action and reduced to 878 acres new initial disturbance and 393 acres new disturbance for LOP	Same as proposed action but increased to 1,496 acres new initial disturbance and 667 acres new disturbance for LOP	No impact	Minimize number and size of disturbance areas; appropriate and timely reclamation, erosion control, and revegetation; adherence to ERRPs.
Changes in vegetation diversity following reclamation (i.e., shrubland to grassland) and potential weed infestation	Negligible - 1,248 acres new initial disturbance and 558 acres new for disturbance LOP	Same as proposed action and reduced to 878 acres new initial disturbance and 393 acres new disturbance for LOP	Same as proposed action but increased to 1,496 acres new initial disturbance and 667 acres new disturbance for LOP	No impact	Appropriate weed control; restrict off-road vehicle travel; revegetation with native/approved species.
Disturbance of wetlands	Negligible - no net loss of wetlands; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of wetlands where possible; obtain COE 404 permits as necessary; adherence to ERRPs.
Reclamation unsuccessful after five years	Negligible to moderate; LOP and beyond	Negligible and reduced by approximately 30% from proposed action	Negligible to moderate but increased by approximately 20% from proposed action	No impact	Further BLM approved reclamation efforts until successful revegetation achieved.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	Alternative 1	Alternative 2	No Action	Mitigation(s)
WILDLIFE					
Loss of big game crucial habitat	Negligible to moderate; new initial disturbance of 360 acres pronghorn crucial range and 165 acres mule deer crucial range	Same as proposed action and reduced to new disturbance of 253 acres pronghorn crucial range and 116 acres mule deer crucial range	Same as proposed action but increased to new disturbance of 431 acres pronghorn crucial range and 197 acres mule deer crucial range	No impact	Minimize project activities in these areas; appropriate reclamation with shrub species.
Loss of sage grouse breeding habitat	Moderate; new initial disturbance of 634 acres probable breeding habitat	Same as proposed action and reduced to 446 acres new disturbance	Same as proposed action but increased to 760 acres new disturbance	No impact	Minimize project activities in these areas; appropriate reclamation with shrub species.
Loss of raptor nesting buffer	Moderate; new initial disturbance of 594 acres raptor nesting buffer	Same as proposed action and reduced to 418 acres new disturbance	Same as proposed action but increased to 712 acres new disturbance	No impact	Implementation of nesting surveys; avoidance of nesting buffer during critical periods.
Animal displacement and/or stress	Moderate; 1,248 acres new initial disturbance, 558 acres new disturbance, and increased human activity; LOP	Same as proposed action and reduced to 873 acres new disturbance and 393 acres new disturbance for LOP	Same as proposed action but increased to 1,496 acres new disturbance and 667 acres new disturbance for LOP	No impact	Avoid construction and other activities within crucial habitats during critical periods.
Increased wildlife mortality from activities of man	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Appropriate road design; employee education; appropriate containment and disposal of hazardous material.
Overall wildlife habitat degradation	Negligible to moderate; LOP	Negligible to moderate and reduced by approximately 30% from proposed action	Moderate but increased by approximately 20% from proposed action	No Impact	Appropriate erosion control and reclamation techniques; appropriate monitoring, containment, and disposal of hazardous material.
WILD HORSES					
Wild horse displacement or mortality due to habitat destruction or other activities of man	Negligible to moderate; 1,248 acres new initial disturbance and 558 acres new disturbance for LOP	Same as proposed action and reduced to 878 acres new initial disturbance and 393 acres new disturbance for LOP	Same as proposed action but increased to 1,496 acres new initial disturbance and 667 acres new disturbance for LOP	No impact	Employee education; appropriate and timely revegetation.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	**Alternative 1**	**Alternative 2**	**No Action**	**Mitigation(s)**
	THREATENED AND ENDANGERED SPECIES/STATE SENSITIVE SPECIES				
Mortality or disturbance of any listed or candidate T&E species or disturbance of critical habitat for listed and candidate T&E species	Negligible - no known bald eagle or peregrine falcon nests or roosts; no confirmed black-footed ferret sightings; no surface water withdrawal	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Minimize habitat disturbance; avoid prairie dog colonies where possible; implementation of black-footed ferret surveys as required; pre-disturbance surveys for candidate species; appropriate and timely reclamation and revegetation.
Reduction in state sensitive species due to mortality or habitat removal	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of habitats of potential occurrence where possible.
	CULTURAL RESOURCES				
Disturbance/destruction of important sites	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Cultural surveys and data recovery as required.
Loss of important cultural materials due to private collection or vandalism	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Employee education; disciplinary action as appropriate.
Disturbance of important Native American religious or culturally significant sites	Negligible - no known sites occur on CBGA; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	None.
	SOCIOECONOMICS				
Increase in population	Negligible - adequate infrastructure exists; LOP	Same as proposed action	Same as proposed action	No impact	Employment of as many local personnel as possible.
Increase in demand for temporary housing	Negligible to beneficial - numerous vacancies exist; LOP	Same as proposed action	Same as proposed action	No impact	Employment of as many local personnel as possible.
Increase in demand for local government facilities or services	Negligible - adequate infrastructure exists and increased revenues will be available; LOP	Same as proposed action	Same as proposed action	No impact	Employment of as many local personnel as possible.
Disruption or change of character of communities	Negligible - towns developed during boom and bust cycles; LOP	Same as proposed action	Same as proposed action	No Impact	Employment of as many local personnel as possible.

Table 2.6 (Continued)

Impact by Environmental Resource	Post Mitigation Impacts				
	Proposed Action	Alternative 1	Alternative 2	No Action	Mitigation(s)
SOCIOECONOMICS (Continued)					
Increase in tax revenue and royalties and stimulation of local economy	Beneficial - increased federal, state, and local revenues; LOP	Same as proposed action	Same as proposed action	Moderate - no increased revenues	None.
LAND USE					
Reduction of AUMs for livestock, wild horses, and wildlife	Negligible - initial loss of 167 AUMs from CBGA; LOP	Same as proposed action and reduced to 117 AUMs lost	Same as proposed action but increased to 200 AUMs lost	No impact	Appropriate and timely reclamation; revegetation with palatable and productive species.
Temporary loss of mineral development opportunities	Negligible - no active coal or uranium mines; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of active quarry.
Changes in character and recreational uses of the area due to construction, presence of facilities, noise, dust, odor, and increased human activities	Moderate - existing development precludes some recreational uses; no developed recreation areas occur on CBGA; LOP	Moderate and reduced by approximately 30% from proposed action	Moderate but increased by approximately 20% from proposed action	No impact	Appropriate road maintenance; use of equipment mufflers; minimize disturbance areas; appropriate and timely reclamation.
Infringement on prior rights	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Avoidance of existing ROWs where possible; appropriate construction at ROW crossings.
VISUAL RESOURCES					
Modification in the basic elements (form, line, color, or texture) of visual resources by presence of facilities and equipment, or modification during construction	Negligible to moderate - all disturbance is in VRM Class III and IV areas; LOP	Negligible to moderate and reduced by approximately 30% from proposed action	Moderate to significant - wells on an 80-acre spacing pattern may dominate some views	No impact	Structures painted with standard environmental colors and located to blend with surrounding landscape; appropriate and timely reclamation and revegetation.
HAZARDOUS MATERIALS					
Soil, surface water, and groundwater contamination and wildlife exposure	Negligible; LOP	Negligible and reduced by approximately 30% from proposed action	Negligible but increased by approximately 20% from proposed action	No impact	Adherence to hazardous materials management and spill prevention and control countermeasure plans; reserve pit lining, netting, and fencing; appropriate monitoring, containment, and disposal of hazardous material.

3.0 AFFECTED ENVIRONMENT

This affected environment chapter describes the existing conditions of the physical, biological, cultural, socioeconomic, and visual resources of the CBGA. The resources that are addressed here were identified as issues during the scoping process and the interdisciplinary team (IDT) review of the CBGA.

Critical elements of the human environment (BLM 1988a), their status on the CBGA, and their potential to be affected by the proposed project are listed in Table 3.1. Four critical elements (areas of critical environmental concern, prime or unique farmlands, wild and scenic rivers, and wilderness) are not present on the CBGA and are not further addressed. In addition to the critical elements, topography/physiography, mineral resources, geology and geologic hazards, paleontological resources, soils, noise, odor, biological resources including wild horses, socioeconomics, land use, and visual resources are discussed.

3.1 PHYSICAL RESOURCES

3.1.1 Climate and Air Quality

Climate in the CBGA is classified as continental, semiarid, cold desert (Trewartha and Horn 1980). The mean annual temperature at Wamsutter, 11 mi northwest of the CBGA, and Dixon, 11 mi southeast of the CBGA, is approximately 41°F (Martner 1986). Average daily temperature ranges from 17°F in January to 67°F in July, with an extreme low of -40°F and an extreme high of 97°F at Wamsutter. The average frost-free period ranges from 85 to 100 days.

The CBGA is in a transition area between the 7 to 9 inch and 10 to 14 inch precipitation zones (BLM 1987:135). Approximately 67% of the average precipitation at Wamsutter (6 inches) occurs during spring and summer (Martner 1986). At Dixon, the yearly average of 11 inches of precipitation is more evenly distributed throughout the year. The CBGA receives an average of 30 thunderstorms each year. Mean annual pan evaporation is relatively high at 70 inches (Martner 1986).

Winds are predominantly from the west and southwest (Martner 1986). Wind speeds average 12 mph throughout the year (Martner 1986), but higher speeds are common during afternoon hours and in winter (BLM 1992b).

Air quality in the region is generally good (BLM 1992a). Most of the CBGA is located in the Laramie Air Basin, and northern portions are located in the Great Divide Air Basin (BLM 1987:168). Both basins are designated as Prevention of Significant Deterioration (PSD) Class II areas under the WDEQ-AQD Implementation Plan (BLM 1987:154). PSD Class II areas are those that may be developed, and the release of limited concentrations of certain pollutants over ambient levels is permitted as long as National Ambient Air Quality Standards are maintained (WDEQ 1989). The nearest PSD Class I areas (areas where little air quality deterioration is allowed) are the Mount Zirkle Wilderness in Colorado, located approximately 50 mi southeast, and the Savage Run Wilderness, located approximately 65 mi east. The Savage Run Wilderness is not a mandatory PSD Class I area (BLM 1992a).

The principal air quality pollutant in Wyoming is total suspended particulates (TSP) (BLM 1987:157). Fugitive dust (uncontrolled, wind-carried particles) from natural sources, gas exploration and development operations, and unpaved roads increases the ambient levels of particulates in and adjacent to the CBGA, especially during dry, windy periods. No violations of PSD Class II air quality standards for TSP are known for the CBGA (BLM 1987:157-161).

Climatic factors such as prevailing winds, atmospheric stability, and mixing heights affect air quality by influencing the ability of air to disperse or dilute pollutants. Unstable conditions caused by

Table 3.1 Critical Elements of the Human Environment, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Element[1]	Status on MPA	Addressed in Text of EIS
Air quality	Potentially affected	Yes
Areas of critical environmental concern	None present	No
Cultural remains	Potentially affected	Yes
Farmlands, prime or unique	None present	No
Floodplains	Potentially affected	Yes
Native American religious concerns	No effects anticipated	Yes
Threatened and endangered species	No effects anticipated	Yes
Wastes, hazardous or solid	Potentially affected	Yes
Water quality	Potentially affected	Yes
Wetlands/riparian zones	Potentially affected	Yes
Wild and scenic rivers	None present	No
Wilderness	None present	No

[1] As listed in BLM *National Environmental Policy Act Handbook H-1790-1* (BLM 1988a).

vertical movement of air near the ground heated during the day and neutral air combined with relatively high wind speeds provide conditions conducive to dispersing and diluting pollutants, thereby maintaining air quality (BLM 1987:157). Unstable or neutral conditions, coupled with high wind speeds, occur more than 70% of the time throughout most of the Great Divide Resource Area.

3.1.2 Topography and Physiography

Most of the CBGA lies on the eastern rim of the Washakie Basin in southcentral Wyoming (Hettinger et al. 1991; Love 1961; Post 1955) (Map 3.1). The northernmost portion of the CBGA crosses the Wamsutter Arch (a structural high separating the Washakie and Great Divide Basins) into the southeastern corner of the Great Divide Basin. The eastern boundary of the CBGA is a transitional area between the Washakie Basin and the Sierra Madre Mountains and includes the Dad Arch (another structural uplift). To the west is the Washakie Basin, and to the south is the Little Snake River valley.

Because the CBGA is located among basins, divides, and mountains, topography and physiography in the area are complex. Much of the area is moderately steep and dissected by numerous ephemeral stream valleys descending from uplands (e.g., Robber's Gulch, Cottonwood Creek). Badlands and escarpments are common features. The flattest portion of the area occurs in the northeast and along Muddy Creek, where mountain streams empty onto the Muddy Creek floodplain (e.g., Mexican Flats, Peach Orchard Flats). Several high uplands occur throughout the CBGA, including the Continental Divide area, the Flat Top Mountains, and the Bluffs. Elevation ranges from 5,850 ft along Muddy Creek to 7,800 ft at the summit of North Flat Top Mountain.

The northern portion of the CBGA drains into the Great Divide Basin where the Continental Divide splits and surrounds the basin, trapping runoff such that it never reaches the ocean. South of the Continental Divide, the CBGA is within the Colorado River watershed, with drainage to Muddy Creek and the Little Snake River to the south.

3.1.3 Geology

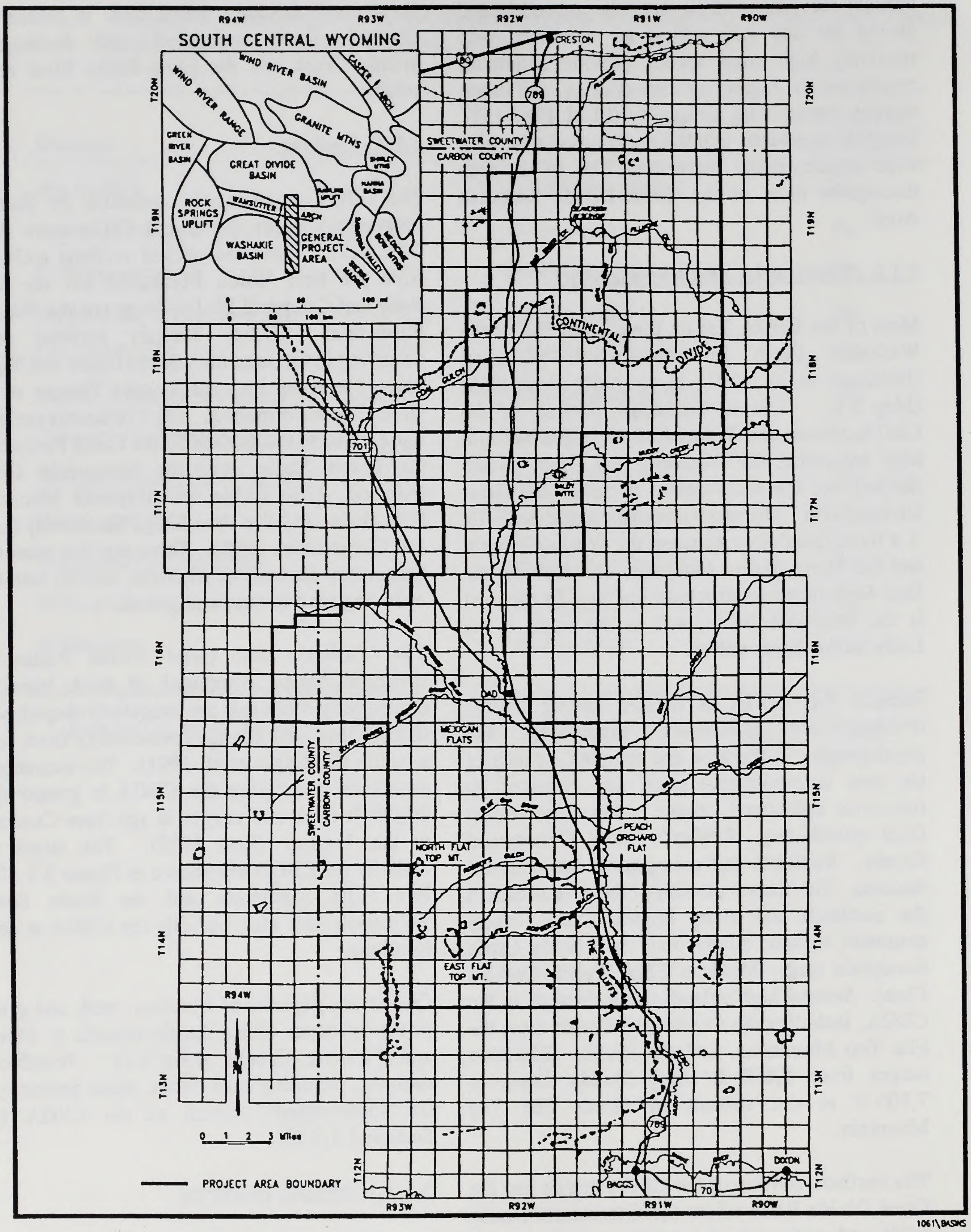
The CBGA is primarily underlain by Tertiary sedimentary rocks (Love and Christiansen 1985) (Map 3.2). The predominant surficial rocks are from the Fort Union Formation and the Main Body and Cathedral Bluffs Tongue of the Wasatch Formation. Other Tertiary surficial rocks occurring in the area include the Laney and Tipton Shale Members and the Luman Tongue of the Green River Formation. The Cretaceous period is represented at the surface by the Lance Formation, the Lewis Shale, and the Mesaverde Group (Almond, Allen Ridge, and Haystack Mountains Formations and the Pine Ridge Sandstone) (Love and Christiansen 1993). There are also numerous Quaternary deposits of alluvium, aeolian materials including sand dunes, and gravel.

The Washakie and Great Divide Basins are structural basins composed of thick layers of sedimentary rocks that are irregularly shaped, vary in thickness, and change considerably from north to south (Hettinger et al. 1991). The sequence of sediments underlying the CBGA is greater than 20,000 ft thick and ranges in age from Cambrian to the Tertiary (Post 1955). The strata that underlie the CBGA are shown in Figure 3.1. The Fox Hills Sandstone and the Battle Spring Formation may also underlie the CBGA at some locations.

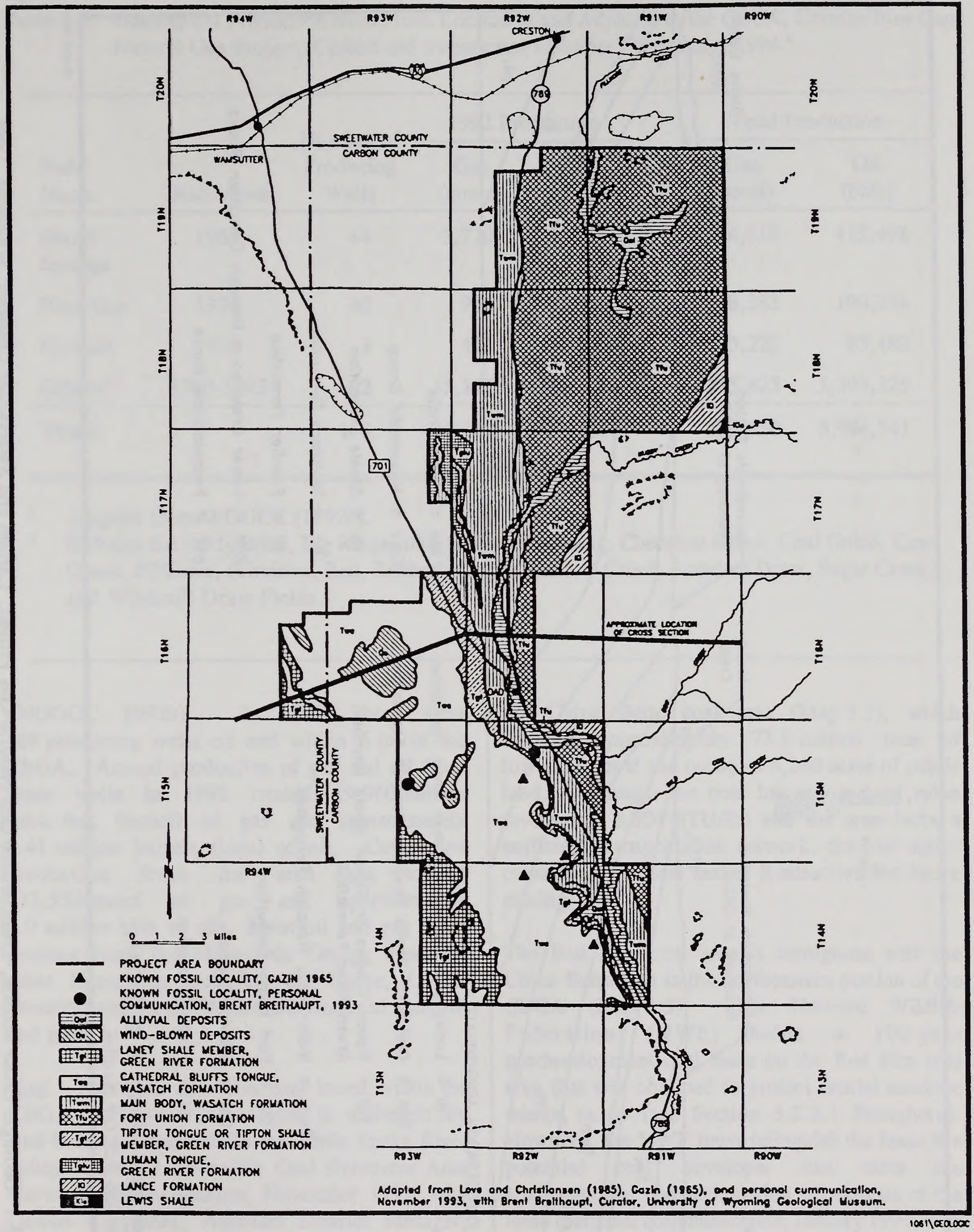
Quaternary deposits of alluvium, sand, and gravel primarily occur along the floodplains of Muddy and Fillmore Creeks (Map 3.1). Windblown deposits, including sand dunes, occur primarily in the southwestern portion of the CBGA (see Section 3.1.3.2).

3.1.3.1 Mineral Resources

Oil and Gas. Oil and gas fields were first discovered in the CBGA in 1960 (Table 3.2)



Map 3.1 Topography and Physiography, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.


R94W
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CRESTON
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80
789
701
SWEETWATER COUNTY
CARBON COUNTY
WAMSUTTER
APPROXIMATE LOCATION OF CROSS SECTION
Qal
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0 1 2 3 Miles
PROJECT AREA BOUNDARY
KNOWN FOSSIL LOCALITY, GAZIN 1965
KNOWN FOSSIL LOCALITY, PERSONAL COMMUNICATION, BRENT BREITHAUPT, 1993
ALLUVIAL DEPOSITS
WIND-BLOWN DEPOSITS
LANEY SHALE MEMBER, GREEN RIVER FORMATION
CATHEDRAL BLUFFS TONGUE, WASATCH FORMATION
MAIN BODY, WASATCH FORMATION
FORT UNION FORMATION
TIPTON TONGUE OR TIPTON SHALE MEMBER, GREEN RIVER FORMATION
LUMAN TONGUE, GREEN RIVER FORMATION
LANCE FORMATION
LEWIS SHALE

Adapted from Love and Christiansen (1985), Gazin (1965), and personal cummunication, November 1993, with Brent Breithaupt, Curator, University of Wyoming Geological Museum.

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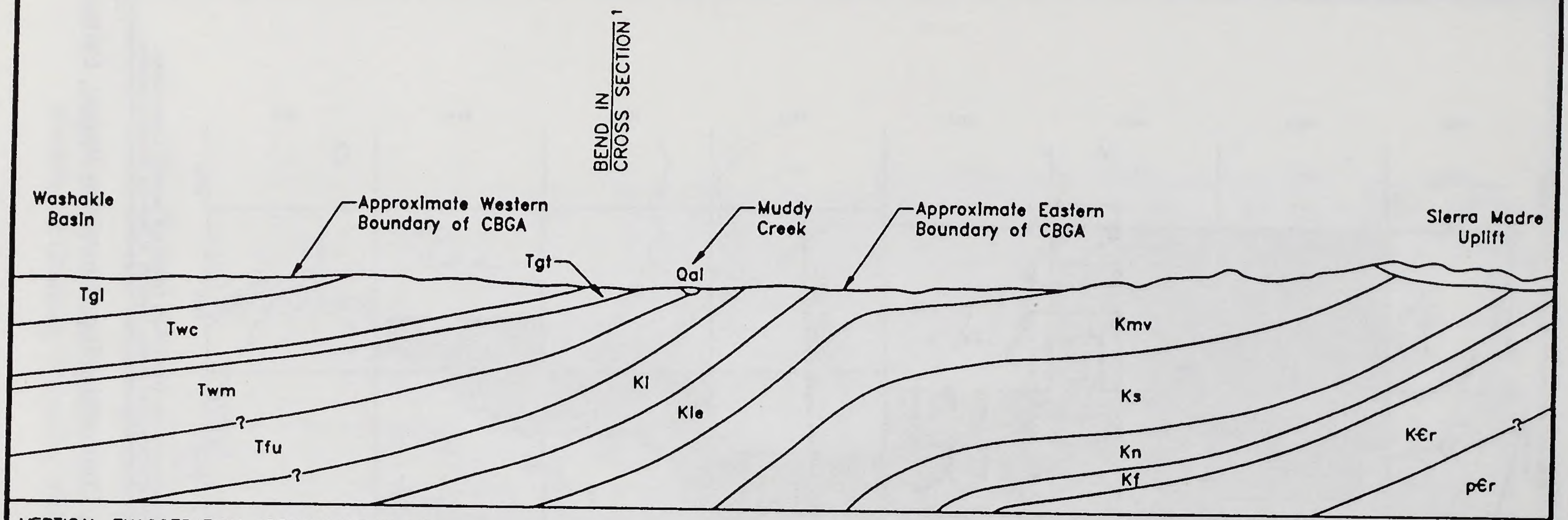
Map 3.2 Surface Geology and Fossil Localities, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.



VERTICAL EXAGGERATION APPROXIMATELY X3

Tgl = Laney Shale Member, Green River Formation

Twc = Cathedral Bluffs Tongue, Wasatch Formation

Tgt = Tipton Tongue or Tipton Shale Member, Green River Formation

Twm = Main Body, Wasatch Formation

Tfu = Fort Union Formation

Qal = Alluvial Deposits

Kl = Lance Formation

Kle = Lewis Shale

Kmv = Mesaverde Group

Ks = Steele Formation

Kn = Niobrara Formation

Kf = Frontier Formation

K€r = Lower Cretaceous through Cambrian Rocks

p€r = Precambrian Rocks

Adapted from Hettinger et al. (1991).

[1]: See Map 3.2 for location

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Figure 3.1 Geologic Cross Section, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Table 3.2 Gas and Oil Production from Fields Located in and Adjacent to the CBGA, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

			1992 Production		Total Production	
Field Name	Discovered	Number of Producing Wells	Gas (mmcf)	Oil (bbls)	Gas (mmcf)	Oil (bbls)
Barrel Springs	1965	44	3,770	38,390	34,619	415,498
Blue Gap	1974	40	966	7,950	18,283	190,238
Creston	1960	3	115	2,320	5,225	85,480
Others[2]	1960-1992	82	15,109	363,171	215,423	5,293,325
Totals		169	19,960	411,831	273,550	5,984,541

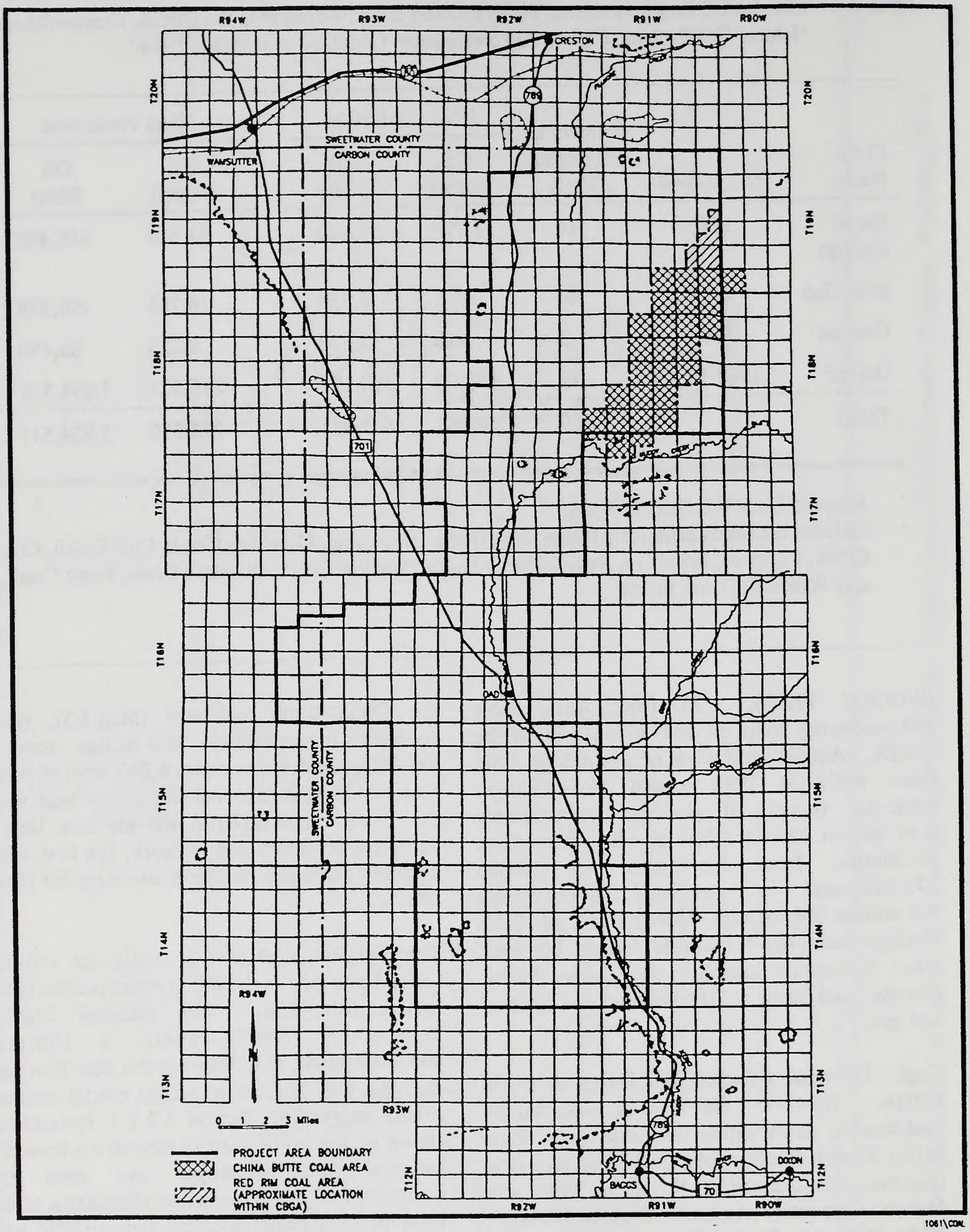
[1] Adapted from WOGCC (1992b).

[2] Includes the Baldy Butte, Big Ridge, Blue Goose, Browning, Cherokee Creek, Coal Gulch, Cow Creek, Fillmore, Primitive, Red, Robber's Gulch, Shallow Creek, Standard Draw, Sugar Creek, and Windmill Draw Fields.

(WOGCC 1992b). In 1992, there were 169 producing wells on and within 6 mi of the CBGA. Annual production of gas and oil from these wells in 1992 totaled 19,960 million cubic feet (mmcf) of gas and approximately 0.41 million barrels (bbls) of oil. Cumulative production from the area has totaled 273,550 mmcf of gas and approximately 6.0 million bbls of oil. Most oil and gas fields produce from the Mesaverde Group; however, other formations including the Lance, Lewis, Frontier, and Steele Shale have produced some oil and gas.

Coal. There are no active coal leases within the CBGA. However, the area is underlain by coal-bearing strata within the Little Snake River valley Known Recoverable Coal Resources Area (personal communication, November 1993, with Dennis Carpenter, Assistant District Manager, BLM, Rawlins). The CBGA encompasses most of the China Butte coal area (Map 3.3), which contains approximately 73.9 million tons of low-sulfur coal and occupies 6,240 acres of public land. Although the coal has a low heat value (averaging 8,800 BTU/lb) and the area lacks a sufficient transportation network, the low sulfur content of this coal makes it attractive for future mining.

The Red Rim coal area is contiguous with the China Butte area in the northeastern portion of the CBGA (Map 3.3). The National Wildlife Federation (NWF) holds a 100 year nondevelopment coal lease on the Red Rim coal area that was obtained to protect crucial antelope winter range (see Section 3.2.2.1 Pronghorn). However, the NWF must relinquish the lease if a potential coal developer can meet the environmental and reclamation stipulations of the lease (personal communication, January 1994, with Tom Lustig, NWF).



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Map 3.3 China Butte and Red Rim Coal Development Areas, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Several other small coal tracts were leased in the 1960s, but the high sulfur content of coal on these tracts precludes economical mining (personal communication, November 1993, with Dennis Carpenter, Assistant District Manager, BLM, Rawlins). These leases were relinquished in 1986.

Oil Shale. The Laney Member, the Tipton Shale Member, and the Luman Tongue of the Green River Formation contain oil shale resources. However, oil shale is not expected to be an economically important mineral in the CBGA in the foreseeable future (BLM 1992a).

Locatable Minerals. Uranium prospecting has occurred in the CBGA since before the mid-1950s (Groth Minerals Corporation 1977), and there are currently several prospects within or immediately adjacent to the CBGA. One active uranium lease exists in the CBGA, and there are no immediate plans to mine this lease. No other known locatable minerals occur within the CBGA in sufficient quantities for economical recovery (BLM 1987:126).

Salable Minerals. Due to high transportation costs, salable minerals within the CBGA are of local importance only (BLM 1987:127). There is one active gravel quarry in the CBGA (personal communication, November 1993, with Mark Newman, Geologist, BLM, Rawlins). Other recoverable deposits of sand, gravel, stone, scoria, and/or clay probably occur, but none are presently being mined.

3.1.3.2 Geologic Hazards

The potential for seismic activity within the CBGA is low (personal communication, September 1993, with James Case, WGS), and there are no known or suspected active faults in the area (Case et al. 1990). The nearest earthquake epicenter to the CBGA is approximately 4 mi north of Wamsutter (Map 3.4). The latest earthquake occurred in 1966. There are no known abandoned mines in the area, and thus, there is no potential for subsidence (personal communication, December 1993, with James Case, WGS, and January 1994, with Roy Spears, U.S. Department of Energy, Laramie).

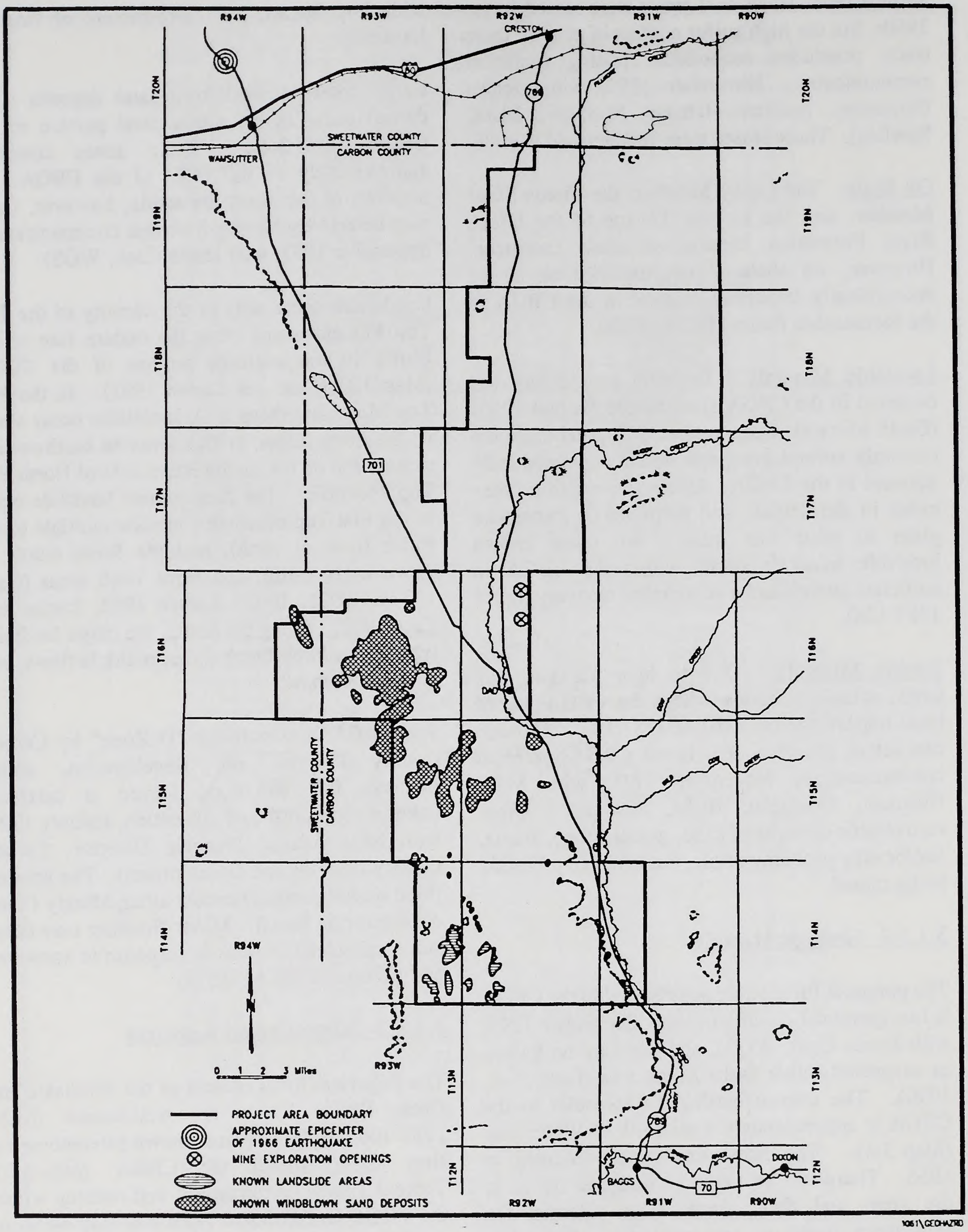
Large areas of windblown sand deposits (i.e., dunes) occur in the southcentral portion of the CBGA (Map 3.4). These dunes comprise approximately 16 mi^2 (5%) of the CBGA. A majority of the dunes are stable; however, some may be actively moving (personal communication, September 1993, with James Case, WGS).

Landslides occur only in the vicinity of the Flat Top Mountains and along the eastern face of the Bluffs in the southern portion of the CBGA (Map 3.4) (Case and Larsen 1991). In the Flat Top Mountains (Map 3.1), landslides occur along northeastern slopes, in high areas on southwestern slopes, and on the southwestern side of North Flat Top Mountain. The predominant landslide types in the Flat Top Mountains include multiple block slides (rock or earth), multiple flows (earth or debris-laden earth), and slope wash areas (Case 1992a, 1992b, 1992c; Larsen 1992; Larsen and Case 1992). Along the Bluffs, the major landslide types are multiple block slides, multiple flows, and multiple slumps.

The CBGA is classified a "D Zone" by Carbon County Planning and Development, which indicates that the flood hazard is currently unknown (personal communication, January 1994, with Nina Adams, Planning Director, Carbon County Planning and Development). The greatest flood hazard probably occurs along Muddy Creek during spring runoff. Minor flooding may occur along ephemeral streams in response to snowmelt and rainstorms (BLM 1992a).

3.1.3.3 Paleontological Resources

The important fossil records of the Washakie and Great Divide Basins are well-known (BLM 1987:106, 1992a). Several known paleontological sites occur within the CBGA (Map 3.2). Table 3.3 lists the formations that outcrop within the CBGA and the fossil types that may be found within each formation. Two localities, one of which contains a diverse assemblage of animal



Map 3.4 Geologic Hazards, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Table 3.3 Fossil Types Known to Occur in Formations Present in the CBGA, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Fossil Type	Green River Formation	Wasatch Formation Main Body	Wasatch Formation Cathedral Bluff Tongue	Fort Union Formation	Lance Formation	Lewis Shale
Mammals	X	X	X	X	X	
Marsupials	X		X		X	
Insectivores	X		X	X	X	
Primates	X	X	X	X		
Tillodonts (insectivores)	X		X			
Rodents	X	X	X			
Carnivores	X	X	X	X		
Condylarths (ungulates)	X	X	X	X	X	
Perissodactyls (odd-toed ungulates)		X	X			
Artiodactyls (even-toed ungulates)			X			
Creodonts (archaic carnivores)		X		X		
Multituberculates (herbivores)				X	X	
Birds	X			X	X	
Reptiles	X			X	X	
Dinosaurs					X	
Amphibians	X			X	X	
Fish	X		X	X	X	X
Invertebrates	X		X	X	X	X
Insects	X					
Plants	X			X	X	
Fungi	X					
Flagellates	X					
Bacteria	X					

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[1] Adapted from Breithaupt (1982, 1985, 1990), Cody (1962), Gazin (1965), Grande (1984), Morris (1954), Ostrum (1965), Roehler et al. (1988), Winterfield (1979), and Wood and Ormsbee (1954). Blank spaces indicate that either the fossil type does not occur in the formation or data on fossil type occurrence were not encountered during the paleontological literature review.

fossils, are currently being described (personal communication, November 1993, with Brent Breithaupt, Curator, University of Wyoming Geological Museum). Gazin (1965) also reported several fossil localities in the CBGA. In the Dad Area, and west to the Sweetwater County line, numerous mammalian fossils have been recovered from the Cathedral Bluffs Tongue of the Wasatch Formation (Table 3.3). Along the southern boundary of the CBGA, localities containing mammalian fossils from the Tipton Tongue of the Green River Formation and the Cathedral Bluffs Tongue of the Wasatch Formation have been identified (Roehler et al. 1988).

The Green River Formation contains fossils from each of the five biological kingdoms and is well-known for its abundant fish fossils (Grande 1984) (Table 3.3). Mammalian fossils are not common since Green River fossils are predominantly from lake bed deposits; however, reptile (crocodiles, alligators, a boa constrictor), amphibian (frogs, salamanders), bird (pelicans, grouse), and invertebrate fossils (insects) are abundant. The fossil flora from the Green River Formation contains a diverse mixture of trees, shrubs, and flowers, indicative of a climate similar to that of the present day southeastern U.S.

The Wasatch Formation, especially the Cathedral Bluffs Tongue, contains a diverse mammalian fossil fauna (Table 3.3) (Gazin 1965; Breithaupt 1990; Morris 1954). The mammalian fauna of the Fort Union Formation is apparently less diverse, but there is a noteworthy assemblage of fish, reptiles, amphibians, birds, invertebrates, and plants (Winterfield 1979).

The Lance Formation is one of the most fossiliferous of the Cretaceous rocks in Wyoming. It has been known as the "Ceratops beds" because dinosaurs such as *Triceratops* have been recovered (Wood and Ormsbee 1954; Ostrum 1965; Breithaupt 1982, 1985). Mammalian fauna are apparently less well-represented in Cretaceous rocks than in Tertiary rocks in the CBGA, but fish, reptiles, amphibians, birds, invertebrates, and plants are well-represented. The Lewis Shale is known to contain fossil fish (Breithaupt 1985) and invertebrates (Cody 1962).

3.1.4 Soils

Soil maps for the CBGA indicate over 120 different soil types (BLM 1993a). Soils vary widely depending on topographic position, parent material, local hydrology, slope, and numerous other factors that influence soil formation processes. Because most impacts to soils would occur due to erosional soil loss, and because soil erodibility is usually directly related to topographic position, soils within the CBGA were combined into four major groups based on topography. These major groups are:

- nearly level and gently sloping soils on alluvial fans;
- soils on rolling and residual uplands;
- soils on ridges, steep side slopes, and escarpments; and
- level and nearly level soils on floodplains and bottomlands.

There are no specific soils data for approximately 15% of the CBGA (personal communication, November 1993, with Susan Foley, BLM, Rawlins).

Nearly level and gently sloping soils on alluvial fans are characterized by slopes of 0 to 8% and are typically formed in alluvium derived from sandstone and shale. They occupy approximately 15% of the CBGA, and occur extensively in the southern portion of the area between the Flat Top Mountain uplands and the floodplain of Muddy Creek. In northern portions of the CBGA, these soils occur in isolated patches. Soil textures are typically loamy, ranging from sandy loams to silt loams to clay loams. Depth to bedrock is often greater than 60 inches. Water and wind erosion potentials are usually moderate, although erosion potentials vary and may be slight or severe. A few soils within this group are moderately alkaline. Areas with these soils are primarily used for livestock grazing and wildlife habitat.

Soils on rolling and residual uplands have slopes ranging from 1 to 20%. Parent material is typically residuum (weathered rock) derived from shale, siltstone, sandstone, or other sedimentary rocks. These soils comprise an estimated 30% of the CBGA, are abundant in northern portions, and are common throughout central and southern portions. Soils of this group are typically classified as sandy loams, sandy clay loams, and clay loams, but silty clays and clays also occur. Depth to bedrock is frequently 24 to 32 inches, but there are some soils that are very shallow (less than 7 inches) or deep (greater than 60 inches). Water erosion potential is usually moderate to severe, and wind erosion hazard is generally moderate. Many soils within this group are moderately to strongly alkaline. Major uses of areas with these soils are livestock grazing and wildlife habitat.

Soils on ridges, steep side slopes, and escarpments have slopes ranging from 6 to 90% and have formed in residuum derived predominantly from sandstone and shale. Some associations in this soil group consist primarily of rock outcrops with scattered pockets of soil, and much of the landscape is bedrock-controlled. This group occurs extensively throughout northern and southern portions of the CBGA and occupies approximately 25% of the total area. Soils in this group are most frequently classified as loams, and most are shallow (less than 20 inches deep), although soil depths range from 7 to 40 inches. Water and wind erosion hazard is typically moderate or severe, and soils in this group may be moderately to strongly alkaline. The predominant uses of areas with these soils are livestock grazing and wildlife habitat.

Soils on level and nearly level floodplains and bottomlands are the predominant soil group in the central portion of the CBGA, especially in the vicinity of Mexican Flats, Barrel Springs Draw, and Muddy Creek. This group occupies approximately 15% of the CBGA. Slopes are 0 to 12%, except in areas adjacent to incised channels where slopes may be nearly vertical. Soils of this group formed in alluvium derived from silty shale, shale, sandstone, or mixed sources; are typically greater than 60 inches deep; and are commonly classified as clay loams, silt loams, and silty clays. However, textures range from gravels to clays. Many soils in this group are moderately to strongly saline and alkaline, and water erosion hazard is usually slight except in areas where streambank cutting occurs during periods of high runoff. Some of these soils receive run-on from adjacent areas, or may have a seasonally high water table of less than 3 ft. The wind erosion hazard is typically moderate, and areas with these soils are used for livestock grazing and wildlife habitat.

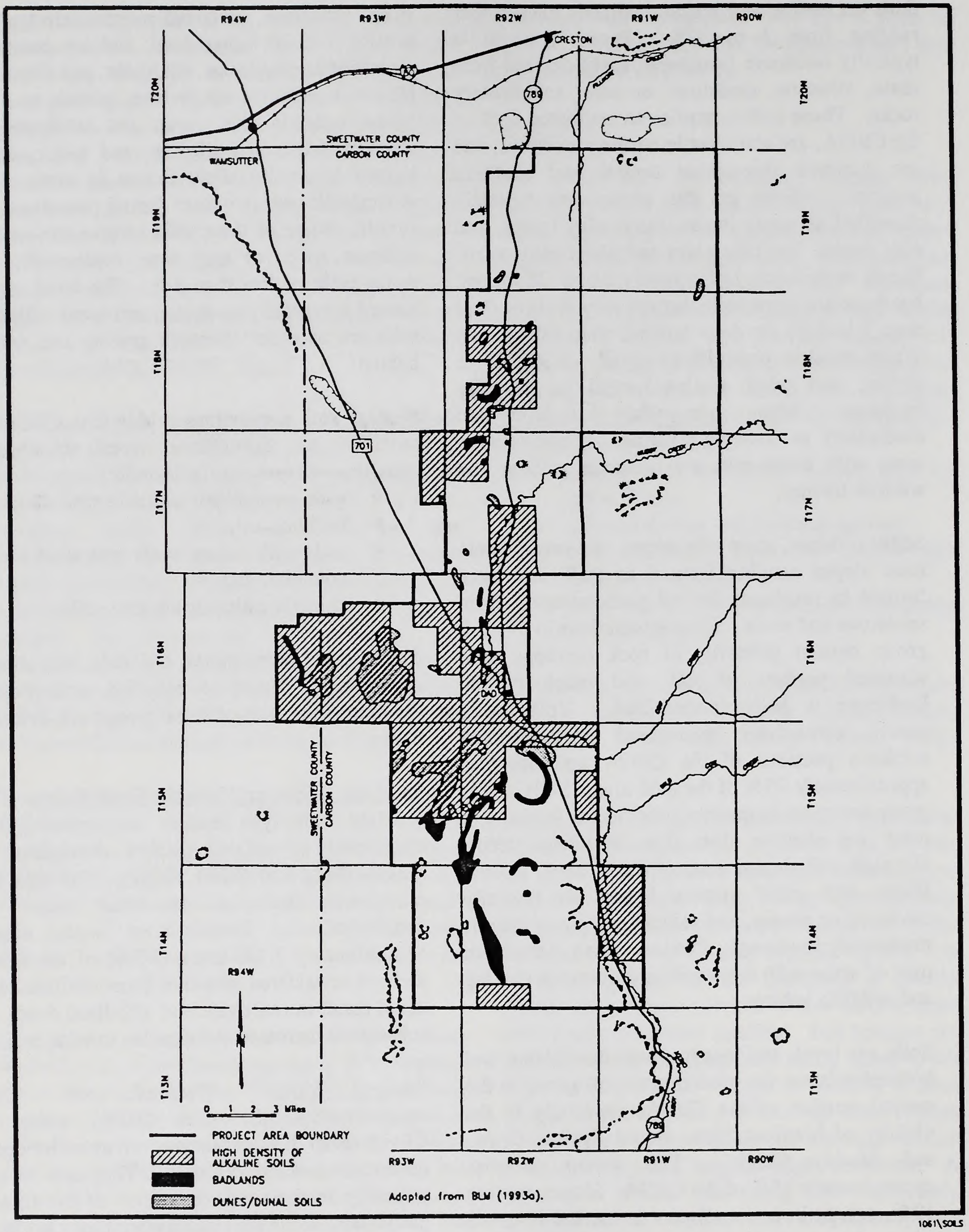
Several soil associations within the CBGA are sensitive to disturbance from development activities. Sensitive soils include:

- soils on stable or unstable sand dunes,
- badland soils,
- soils with severe water and wind erosion potential, and
- strongly saline or alkaline soils.

The distribution of dunes, badlands, and alkaline soil areas is shown on Map 3.5, and potential limitations for each of these groups are described below.

Soils on Stable or Unstable Sand Dunes. The Kandaly soil type occurs on dunes and is distributed in isolated patches throughout the CBGA (Map 3.5) (BLM 1993a). The type also occurs as inclusions in other major soil associations. These dunal soils occupy approximately 7,180 acres (3.5%) of the CBGA and are considered sensitive because disturbance could result in reactivation of stabilized dunes and subsequent increased soil loss due to wind erosion.

Badland Soils. Badland soils occupy approximately 5,515 acres (2.7%) within the CBGA (Map 3.5) and may occur as inclusions in numerous soil associations. They are located primarily in the southern portion of the CBGA, particularly along the rim between Blue Gap Draw and Muddy Creek, and adjacent to Windmill Draw (Map 3.1) (BLM 1993a). Badland areas have very



Adapted from BLM (1993a).

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Map 3.5 Sensitive Soil Locations, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

unstable slopes and extremely erodible soils, and disturbance generally accelerates erosion. Furthermore, because badland soils are highly unstable, roads and other structures are difficult to build and maintain.

Soils with Severe Water and Wind Erosion Potential. Soils with severe erosion potential are abundant throughout the CBGA. In many areas, slopes are greater than 30%, and soils have severe water erosion potential. Fine-textured soils and soils on windblown deposits are particularly susceptible to wind erosion, especially if vegetation is removed.

Strongly Saline and Alkaline Soils. Soils containing abundant salts are included as sensitive soils because they are difficult to revegetate. Many soil associations within the CBGA are strongly alkaline. Soils with strongly alkaline topsoil (less than 6 inches deep) occupy approximately 42,144 acres (20%), mostly in the central portion of the CBGA (Map 3.5). Strongly alkaline topsoil also occurs east of Muddy Creek and in northwestern portions of the CBGA. These soils must be given special consideration during reclamation planning to ensure successful revegetation.

3.1.5 Water Resources

3.1.5.1 Surface Water

Surface Water Occurrence. Surface drainage in the CBGA is separated by the Continental Divide. Northern portions of the area drain into the Great Divide Basin, which has no hydrologic outlet, whereas southern portions drain into the Little Snake River and are part of the Colorado River watershed.

Muddy Creek is the major perennial stream in the southern portion of the CBGA and is within the Little Snake River Conservation District. A portion of Muddy Creek within the CBGA is a BLM-designated riparian demonstration area where a substantial amount of riparian zone research has been conducted (Lowry 1988; Goertler 1992). Although it is considered a perennial stream, periods of no flow are common, especially during fall and winter (Goertler 1992). Most flow occurs in spring during snowmelt, or after storms. For the period between 1988 and 1991, mean daily flow in Muddy Creek near Baggs averaged 15 cubic feet per second (cfs) and was highest in March through May (30 to 60 cfs) and lowest in January and February (0.5 cfs) (U.S. Geological Survey [USGS] 1993).

Muddy Creek is a tributary of the Little Snake River, which is the major river downstream from the CBGA. Flow in the Little Snake River near Dixon (1973-1992) averaged 595 cfs and was highest in April through June (USGS 1993).

Most streams within the CBGA are ephemeral, flowing only briefly in the spring during snowmelt or after rain storms. The major ephemeral streams south of the Continental Divide include Barrel Springs Draw, Windmill Draw, and Blue Gap Draw. Flow in Barrel Springs Draw ranged from 0 to 0.56 cfs and averaged 0.16 cfs during spring and summer months between 1986 and 1991 (BLM 1993a).

North of the Continental Divide, Fillmore Creek is the major stream. It is intermittent and flows northeast into Separation Creek, which in turn flows into Separation Lake. Flow data for Fillmore Creek are not available. Coal Bank Creek and Bad Water Creek are other major ephemeral channels north of the divide.

There are 19 ponds, impoundments, and reservoirs in the CBGA. They are generally located in low areas in or adjacent to the major drainages. They are small and ephemeral, seasonal, or semipermanent (USFWS 1991). Impounded water is used primarily for livestock and wildlife watering.

Surface Water Quality and Use. Surface water quality in the CBGA is fair. Muddy Creek is a Class 3 water (WDEQ 1990). Class 3 waters are those waters other than Class 1 waters which support nongame fish only, have the potential to support nongame fish only, or include nursery areas or food sources for nongame fish only. All other streams within the CBGA are Class 4 waters, which are those waters other than Class 1 that do not support fisheries. Class 4 waters are protected under WDEQ regulations for agricultural and wildlife watering uses.

In a qualitative assessment of water quality in Muddy Creek in the vicinity of the CBGA, only primary contact recreation and industrial uses are supported (Gumtow 1992); however, some water from Muddy Creek is used for irrigation of hay meadows in central and eastern portions of the CBGA. Nongame fisheries are only partially supported, and irrigation and livestock watering are considered threatened. The primary causes of water quality impairment in the creek are sediment, silt, salinity, and total dissolved solids (TDS), and the sources of impairment are livestock grazing; highway, road, and bridge construction; petroleum activity; vegetation removal; and natural processes.

Limited surface water quality data are available for the CBGA. Existing data for Muddy Creek indicate that it is high in calcium (54 mg/l) and magnesium (44 mg/l) (BLM 1993a), and in cations and anions in general (190-300 mg/l) (Lowry 1988). TDS content is high (1,000-1,500 mg/l) (BLM 1993a) making this stream unsuitable for domestic uses but generally suitable for livestock. Several reaches of the stream are notably degraded and actively eroding, causing increased in-stream sediment loads (Goertler 1992).

Water quality in Barrel Springs Draw is relatively hard, due to high levels of calcium (60.5 mg/l) and magnesium (23.6 mg/l). TDS concentrations average 3,889.1 mg/l with sodium (1,147 mg/l) and sulfate (2,241.4 mg.l) being the dominant ions (BLM 1993a).

The Little Snake River, located approximately 6 mi south of the CBGA, is a Class 2 water which supports or has the potential for supporting game fish, or has nursery areas or food sources for game fish. In the Little Snake River, primary contact recreation, livestock and wildlife watering, irrigation, industrial, and human health value criteria are supported by the existing water quality (Gumtow 1992). Cold-water fisheries are partially supported. The principal cause of water quality impairment is sediment and silt, and impairment sources are highway, road, and bridge construction, vegetation removal, and wetland drainage and filling.

Since southern portions of the CBGA are within the Colorado River watershed, all activities that potentially affect surface water quality must be in compliance with the Colorado River Salinity Act (Colorado River Basin Salinity Forum 1990). This act states that average annual salinity in the lower main stem of the Colorado River system must be maintained at or below 1972 levels (723 mg/l TDS below Hoover Dam). Summer TDS concentrations (1975-1986) in the Little Snake River near Dixon averaged approximately 150 mg/l (USGS 1993).

3.1.5.2 Groundwater

Groundwater Occurrence. Groundwater within the CBGA occurs in both confined (artesian) and unconfined (water table) aquifers (Welder and McGreevy 1966). The confined aquifers are generally in pre-Oligocene rocks whereas the unconfined aquifers are in upper Tertiary and Quaternary strata. Formation lithologic properties and their potential for groundwater aquifers within the CBGA are listed in Table 3.4. Water-bearing formations beneath the Mesaverde Group would not be affected by the proposed project and therefore are not discussed.

The Great Divide and Washakie Basins are separated by the Wamsutter Arch and are essentially independent hydrologic systems (Welder and McGreevy 1966). However, within-basin hydrologic systems are probably indirectly or partially connected, giving some hydrologic continuity to groundwater systems. Sandstones are the predominant water-bearing rocks. Properties of individual aquifers are highly variable, depending on aquifer thickness, grain

Table 3.4 Stratigraphy and Potential Groundwater Occurrence in Rock Formations Present in the CBGA, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Age/Strata (approximate thickness in ft)	Lithology	Groundwater Potential
QUATERNARY		
Alluvial deposits (0-50)	Clay, silt, sand, and gravel, unconsolidated; includes some slope wash material. Coarser alluvial deposits occur in the Little Snake River valley and in or adjacent to highlands.	Contain small quantities of water in many stream valleys; generally small yields and a wide range in TDS; larger yields are possible in the Little Snake River valley.
Windblown sand (0-70)	Sand and silt, unconsolidated. Both active and inactive sand dunes are scattered throughout the CBGA.	In areas where the dunes are relatively thick and extensive, wells and springs yield 1 to 20 gallons per minute (gpm). TDS of water in the sand dunes ranges from 200 parts per million (ppm) to about 2,000 ppm. Dunes act as infiltration areas for recharge to underlying formations.
Gravel deposits (0-50)	Sand and gravel, poorly consolidated to unconsolidated, and some conglomerate. Extensive but scattered outcrops are present southeast of the Great Divide Basin, and in the Rawlins Uplift (Map 3.1).	Groundwater potential is unknown, but probably poor because deposits are generally topographically high and probably well-drained.
TERTIARY		
Laney Shale Member of the Green River Formation (0-1,900)	Marlstone, shale, oil shale, muddy sandstone, tuffaceous sandstone, and algal limestone. Subsurface mapping indicates that the Laney may be as much as 3,000 ft thick in the Washakie Basin.	Groundwater potential is poor to good. Wells in the western Washakie Basin have yields as high as 200 gpm and TDS ranging from 500 to 900 ppm. Elsewhere in the Washakie Basin, wells have lower yields, and the water has a higher TDS.
Cathedral Bluffs Tongue of the Wasatch Formation (0-2,500)	Claystone and shale, gray, green, and red; contains fine-grained sandstone in the Washakie Basin.	Very low yields of mineralized water in most of the area.
Tipton Tongue and Tipton Shale Member of the Green River Formation (0-400)	Oil shale, fine-grained calcareous sandstone, clay, shale, and algal limestone.	Groundwater potential is probably poor.

Table 3.4 (Continued)

Age/Strata (approximate thickness in ft)	Lithology	Groundwater Potential
TERTIARY (Continued)		
Main body of the Wasatch Formation (1,000-4,000)	Claystone and siltstone, brightly colored; fine- to medium-grained calcareous sandstone; carbonaceous shale, oil shale, and coal.	A good source of water in the area. Contains more than one aquifer; wells in the deeper aquifers flow in some areas. About 90 wells having yields from 5 to 250 gpm of water. The maximum yield of a favorably located well may be as much as 500 gpm. TDS ranges from 500 to 2,800 ppm.
Fort Union Formation (700-2,700)	Sandstone, fine- to coarse-grained, carbonaceous shale, and coal; contains varicolored siltstone and claystone in upper part.	A relatively good water source in the area. Yields of 11 wells ranged from 3 to 300 gpm. A well penetrating the entire formation where the sandstones are thickest may yield as much as 500 gpm. TDS of water from four wells ranged from about 800 to 3,320 ppm.
CRETACEOUS		
Lance Formation (0-4,500)	Sandstone, very fine- to fine-grained, lenticular, clayey, calcareous; dark gray or brown shale; coal; and lignite.	Groundwater potential is largely unknown. Seven stock wells have estimated yields of 5 to 30 gpm. Maximum yields would likely be less than 300 gpm.
Lewis Shale (0-2,700)	Shale, light to dark gray, calcareous to noncalcareous, carbonaceous; contains beds of siltstone and very fine-grained sandstone. Numerous sandstones occur in the eastern Washakie Basin.	Groundwater potential is generally poor, but sandstones probably will yield small quantities of water.
Mesaverde Group (300-2,800)	Sandstone, light gray to brown, very fine- to medium-grained, calcareous, silty; interbedded dark shale, lignite, and coal.	Groundwater potential is largely unknown. Two wells have yields of about 5 and 40 gpm, and the water has TDS of 5,300 and 1,300 ppm, respectively (see Table 2.5).

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[1] Adapted from Welder and McGreevy (1966).

size and shape, sorting, and the areal extent of the aquifer. All of these factors affect the ability of an aquifer to store and transmit water.

Quaternary aquifers beneath the CBGA are composed of unconsolidated sand and gravel and occur primarily along Muddy Creek. These aquifers are typically highly permeable and transmit water to underlying aquifers; therefore, they do not yield significant amounts of water (Table 3.4) (Welder and McGreevy 1966).

The Laney Shale Member of the Green River Formation outcrops along the rim of the Washakie Basin. Water wells in this formation yield 0 to 200 gpm (Table 3.4) (Collentine et al. 1981). Lower portions of the Laney may be dry. There are no specific groundwater data for other members of the Green River Formation, although they are probably poor groundwater producers due to the presence and low permeability of marlstone and oil shale and the absence of thick and extensive sandstones (Welder and McGreevy 1966).

The Main Body of the Wasatch Formation is an important aquifer in both the Great Divide and Washakie Basins, especially along the flanks of the Wamsutter Arch (Table 3.4) (Welder and McGreevy 1966, Collentine et al. 1981). Most water wells in the Wasatch Formation are less than 1,000 ft deep, and data from 70 wells in the formation showed that most yielded less than 30 gpm. However, yields as high as 325 gpm have been noted. In the central Washakie Basin, the Wasatch Formation is deep and relatively inaccessible, but wells drilled near outcrops along the basin margin yield one to 400 gpm (Collentine et al. 1981).

Although the groundwater production capabilities of the Fort Union Formation are not well-characterized, the formation is a relatively good source of water (Table 3.4) (Welder and McGreevy 1966). In outcrop areas west of Rawlins, wells in the formation yield from less than 100 gpm to 300 gpm (Collentine et al. 1981). Groundwater production from the Lance Formation is adequate for stock and domestic supplies (Welder and McGreevy 1966), and wells in the Lance Formation yield 5 to 30 gpm (Collentine et al. 1981).

The Mesaverde Group is composed of fine- to medium-grained sandstone interbedded with coal, shale, and lignite (Table 3.4) (Collentine et al. 1981; Welder and McGreevy 1966). It is confined by the Lewis Shale above and the Baxter Shale below and thus is effectively isolated from other aquifers. Well yields range from 15 to 40 gpm.

Groundwater flow in the Quaternary aquifers is controlled in part by topography and gravity. Topography predominantly coincides with surficial structural features in and adjacent to the CBGA (Map 3.1). Downward flow from Quaternary aquifers into underlying formations is also common. In the Green River, Wasatch, Fort Union, and Mesaverde aquifers, flow is from structural highs towards the basin center.

The primary source of recharge for aquifers in the CBGA is from infiltration of snowmelt and runoff water where formations outcrop at the surface, and downward seepage from overlying strata (Welder and McGreevy 1966). Discharge occurs mainly in surface playas, streams, and springs, especially in the vicinity of the Little Snake River and its tributaries. Additional discharge to formations below the Mesaverde aquifer and subsurface flow to formations in the Sandwash Basin in Colorado also occurs.

Groundwater Quality and Use. Groundwater quality is highly variable and depends on the physical properties of the supplying aquifer, the distance from the aquifer outcrop area, and the degree of seepage into an aquifer from other formations. In general, water quality is better near outcrop areas, and poorer quality water occurs in basin interiors (Collentine et al. 1981). In outcrop areas, Quaternary aquifers, localized areas within Tertiary aquifers (Wasatch, Fort

Union, and Green River Formations), and the Mesaverde aquifer generally produce waters with less than 1,000 mg/l TDS (Collentine et al. 1981).

In Quaternary aquifers, TDS range from 200 mg/l to greater than 60,000 mg/l (Table 3.5) (Collentine et al. 1981). In the vicinity of outcrop areas, Tertiary aquifers typically have TDS levels of less then 500 mg/l to 1,500 mg/l. Along the eastern rim of the Washakie Basin, the water from the Wasatch Formation and the Laney Member of the Green River Formation tends to be saline, with TDS levels commonly exceeding 3,000 mg/l. The Lance and Wasatch groundwaters tend to be sodium sulfate types. The Laney Member typically contains sodium, sulfate, and bicarbonate waters, and Fort Union water is highly variable.

Mesaverde groundwater quality is also highly variable (Table 3.5). TDS in Mesaverde water are less than 1,000 mg/l in outcrop areas only. In these areas, sodium and bicarbonate are the predominant ions. Towards the interior of the Washakie Basin, TDS levels of 1,000-3,000 mg/l are common from the Mesaverde Group. Stratigraphic gas traps in the Mesaverde Group are associated with areas of low aquifer permeability which probably contributes to the high salinity often found in this water (see Table 2.5).

EPA drinking water standards for fluoride are locally exceeded in the Mesaverde and overlying aquifers (Collentine et al. 1981). The highest fluoride concentrations were observed in the Mesaverde Group, Wasatch Formation, Laney Member of the Green River Formation, and Fort Union Formation. Some groundwater samples from the Mesaverde Group, Lance Formation, Fort Union Formation, and the Quaternary alluvium contained lead concentrations in excess of standards. The Fort Union, Lance, and Mesaverde groundwaters also show areas with high concentrations of cadmium and chromium.

Radionuclide levels are typically below EPA standards in Washakie Basin groundwater (Table 3.6) (Collentine et al. 1981). EPA standards for drinking water for radium-226 and gross alpha radiation are 5.0 pCi/l and 15.0 pCi/l, respectively. While there is no standard for uranium levels, most groundwater within the Washakie Basin contains less than 10 μg/l of uranium. Exceptions include a sample from the Mesaverde Group, where uranium levels of 34.0 μg/l were observed.

Much of the water used for industrial, agricultural, and domestic purposes on and adjacent to the CBGA is supplied by surface water sources including the Little Snake River (Collentine et al. 1981). In 1981, less than one-third of the water used in the region was supplied by groundwater. Industrial usage associated with energy resource development and electric power generation accounts for a large proportion of the groundwater use. In 1993, there were 194 permitted water wells within the CBGA used for industrial purposes, primarily as development and monitoring wells for the oil and gas industry (WSEO 1993). Agricultural usage is limited to wells developed for stock-watering. Within the CBGA, there are currently 19 wells permitted as stock-watering wells, three of which are also used for domestic purposes. Most of these wells are 100 to 400 ft deep and yield less than 25 gpm.

3.1.6 Noise and Odor

Ambient noise levels throughout the majority of the CBGA are generally rural in nature with the only appreciable noise being associated with traffic along roadways, oil and gas exploration and production activities, occasional airplanes, recreational activities, and wind. An A-weighted decibel (dBA) measure is used to evaluate environmental noise, and common noise sources affecting ambient levels in the CBGA include heavy equipment (90 dBA at 50 ft) and light automobile traffic (50 dBA at 100 ft).

While no specific noise level data are available for the CBGA, human-made noise emanations are likely to be buffered by wind and topography. The majority of the CBGA probably has noise levels in the range described as "Grand Canyon (North Rim)" (wilderness) and "Farm in Valley"

Table 3.5 TDS, Chloride, and Sulfate Concentrations in Selected Groundwaters of the Great Divide and Washakie Basins, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Aquifer	Geographic Area	TDS (mg/l)	Chloride (mg/l)	Sulfate (mg/l)
Quaternary	Great Divide Basin	200-2,050	4-114	25-914
	Washakie Basin	200-60,700	9-31,000	15-1,450
Wasatch	Great Divide Basin	165-1,750	6-110	5-630
	Washakie Basin	450-3,590	5-345	7-1,620
Green River	Great Divide Basin	560-1,810	2-105	10-600
	Washakie Basin	570-7,210	14-1,460	26-3,150
Ft. Union/Lance	Great Divide Basin	84-4,950	3-945	10-2,010
Mesaverde[2]	Great Divide-Washakie Basins	250-64,000	15-35,400	12-2,240

[1] Adapted from Collentine et al. (1981).

[2] See also Table 2.5.

Table 3.6 Radionuclide Concentrations in Selected Groundwaters of the Great Divide and Washakie Basins, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Aquifer	Ra-226 (pCi/l)	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Uranium (μg/l)
Wasatch	1.3±0.3	0±4	5±6	2.0
	–	–	–	15
	0.71	4.5	2.1	2.7
Green River	0±0.1	3±1	4±2	4.0
Fort Union	4	3.4	11.7	1.0
Mesaverde	0.46±0.2	0±2	3±3	0
	0.17	<5.0	4.7	–
	0.88	2.3	4.9	0.5
	0.05	3	<1.7	0.07
	0.12	8.3	7	0.18
	0.86	<6.7	15	<0.01
	0.38±0.16	0±16	16±7	34.0

[1] Adapted from Collentine et al. (1981).

sites (Wyle Laboratories 1971). Median noise levels for those sites ranged from 19 to 39 dBA. Noise-sensitive areas on the CBGA include crucial winter range for mule deer and pronghorn during winter, sage grouse leks during the breeding season, and occupied raptor nests (see Section 3.2.2).

No specific data on odors are available for the CBGA; however, odors present in the area, other than the natural odors of vegetation and wildlife, are likely associated primarily with existing oil and gas wells and associated roads and ancillary facilities. Occasional emissions from cars, trucks, off-road vehicles (ORVs), and oil and gas exploration and production facilities, and smells at livestock concentration areas, also contribute to odors experienced on the CBGA. Most odors on the area are likely to be quickly dispersed by wind.

3.2 BIOLOGICAL RESOURCES

3.2.1 Vegetation

Scientific names of plant species discussed in the following section are presented in Appendix C.

3.2.1.1 Plant Communities

The CBGA is located in a transitional area between the 7 to 9 inch and 10 to 14 inch precipitation zones (BLM 1987:135). Precipitation and other environmental factors (e.g., soils, geology) combine to create unique ecological units known as range sites. Eighteen distinct range sites occur on the CBGA, supporting eight major native vegetation types (U.S. Soil Conservation Service [SCS] 1988; BLM 1987:170-173).

The native vegetation in southern portions of the CBGA has been altered by erosion control/range improvement projects conducted in the 1950s and 1960s. In addition to the detention dams, reservoirs, and waterspreader dike systems built for these projects, many areas were plowed, contour furrowed, and seeded with crested wheatgrass. Crested wheatgrass remains a major component of the plant communities in these areas today. Additionally, some areas along Muddy creek on the CBGA are irrigated for hay production.

Range site and vegetation data are not available for approximately 15% of the CBGA, predominantly from drainage, floodplain, badland, escarpment, and heavily dissected and steep terrain areas. The main areas lacking data include the Muddy Creek floodplain, Bad Water Creek, Fillmore Creek, Coal Bank Creek and some adjacent uplands, badlands in the southern portion of the CBGA, escarpments on the Carbon/Sweetwater County line, steep terrain associated with the Continental Divide, and heavily dissected slopes adjacent to badlands south of Coal Gulch (Map 3.1).

Sagebrush shrubland is the most common vegetation type, occupying 40-45% of the CBGA. This vegetation type occurs extensively in the northern portion of the CBGA; however, large patches are distributed throughout the entire area. Sagebrush shrubland is composed of approximately 75% grasses and grass-like species, 10% forbs, and 15% woody plants (SCS 1988). Big sagebrush is the dominant shrub, and low rabbitbrush and winterfat are common. The understory is dominated by thickspike wheatgrass, streambank wheatgrass, western wheatgrass, bluebunch wheatgrass, canby bluegrass, needle-and-thread grass, and Letterman's needlegrass. Numerous forb and subshrub species are also present including asters, clovers, goldenweed, American licorice, and fringed sage. Ground cover is generally 40 to 50%, and average annual production from rangeland in excellent condition ranges from 700 to 1,500 pounds per acre per year (lbs/ac/year), averaging 1,200 lbs/ac/year in years with normal precipitation. For rangeland in excellent condition, 0.40 animal unit months per acre (AUMs/ac) is the recommended stocking rate. An AUM is defined as the amount of forage required to maintain a 1,000 pound cow and calf under six months of age, five sheep, or 1.25 horses for one month.

The saltbush vegetation type comprises approximately 30% of the CBGA, occupying a large area east of East Flat Top Mountain with scattered patches in upland areas throughout the CBGA. This vegetation type is generally represented by plant communities containing species with high salt tolerances capable of withstanding drought conditions. Vegetation is composed of approximately 55% grasses and grass-like species, 5% forbs, and 40% woody plants (SCS 1988). The shrub component is dominated by Gardner's saltbush, bud sage, greasewood, and winterfat. The most common grasses are western, thickspike, and streambank wheatgrasses, bottlebrush squirreltail, and Indian ricegrass. Forbs are numerous and include asters, eriogonum, milkvetch, and phlox. Ground cover ranges from approximately 20 to 40%, and average production on rangelands in excellent condition during normal years is 600 lbs/ac. The recommended stocking rate for range in excellent condition is 0.50 AUMs/ac.

The greasewood shrubland vegetation type occupies approximately 5% of the CBGA and occurs in low-lying areas along the numerous stream valleys throughout the southern half of the area (e.g., Barrel Springs Draw, Blue Gap Draw, Robbers Gulch, and portions of Muddy Creek). Greasewood shrubland vegetation is composed of approximately 60% grasses and grass-like plants, 10% forbs, and 30% woody plants (SCS 1988). Greasewood is the predominant shrub, and alkali sagebrush, four-wing saltbush, Gardner's saltbush, and rubber rabbitbrush are common. The major grasses include alkali sacaton, basin wildrye, and western, thickspike, and streambank wheatgrasses. Forbs are a minor component, with milkvetch, phlox, povertyweed, and woody aster being the most common. Ground cover averages approximately 55 to 70%, and annual production in normal years on rangeland in excellent condition averages 1,200 lbs/ac. The recommended stocking rate for range in excellent condition is 0.30 AUMs/ac.

Mountain shrub vegetation occupies less than 5% of the CBGA and is concentrated primarily on upland ridges south and east of Baldy Butte in the central portion of the CBGA. Plant species in this type are adapted to very shallow soils and drought conditions, and are composed of approximately 65% grasses and grass-like species, 10% forbs, and 25% woody plants (SCS 1988). The predominant shrubs are mountain mahogany and juniper. Big sagebrush, black sagebrush, skunkbush sumac, antelope bitterbrush, low rabbitbrush, and winterfat are also common. Dominant grass species include bluebunch wheatgrass, bottlebrush squirreltail, Indian ricegrass, and thickspike, streambank, and western wheatgrasses. Some of the numerous forbs common in this type include aster, eriogonum, penstemon, western yarrow, phlox, scarlet globemallow, and goldenweed. Cover ranges from approximately 20 to 30%, and production averages 350 lbs/ac in normal years on lands in excellent condition. A stocking rate of 0.15 AUMs/ac is recommended for range in excellent condition.

The juniper vegetation type comprises less than 5% of the CBGA, occurring on small localized areas in the central and southern portions of the CBGA. Vegetation is composed of approximately 50% grasses and grass-like species, 10% forbs, and 40% woody plants (SCS 1988). The predominant grasses are bluebunch, streambank, thickspike, and western wheatgrasses, Canby bluegrass, Indian ricegrass, and needle-and-thread grass. Juniper dominates the woody component, and big sagebrush is common. Numerous forb species are common, including aster, fleabane, onion, phacelia, pussytoes, western yarrow, clover, phlox, scarlet globemallow, milkvetch, and stonecrop. Vegetative cover is approximately 10 to 25%. Annual production in a normal year on areas in excellent condition averages 1,200 lbs/ac. An appropriate stocking rate for range in excellent condition is 0.15 AUMs/ac.

Barren or nearly barren areas make up less than 5% of the CBGA and are scattered throughout area, primarily along ridge tops. These areas generally have very sparse vegetation containing species that are extremely salt-tolerant and can survive in very shallow soils (SCS 1988). Where vegetation is present, grasses and grass-like species comprise 65% of the type, forbs 10%, and shrubs 25%. The dominant shrubs include Gardner's saltbush and winterfat. The most common grasses include western wheatgrass, bottlebrush squirreltail, and Indian ricegrass. Forb species may include aster, dock, kochia, milkvetch, penstemon, phlox, and scarlet globemallow. Vegetative cover is approximately 10 to 20%, and average production on excellent condition rangelands in normal years is 250 lbs/ac. The recommended stocking rate for range in excellent condition is 0.10 AUMs/ac.

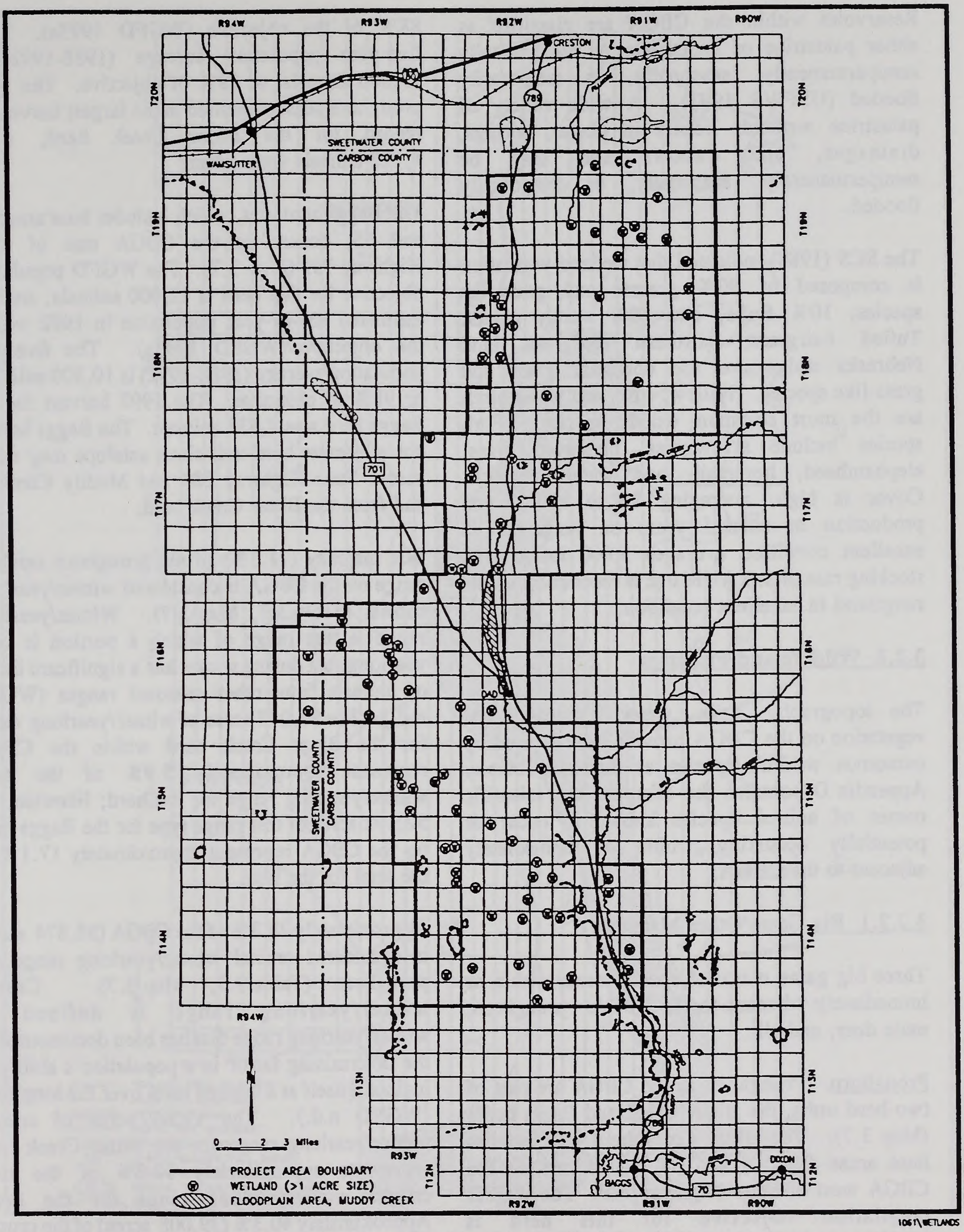
One small patch of grassland vegetation (less than 1% of the CBGA) occurs in the central portion of the CBGA. This vegetation type is composed of 50% grasses and grass-like species, 10% forbs, and 40% woody plants (SCS 1988). Rhizomatous wheatgrasses (streambank, thickspike, and western) dominate the grass component of the type, and bottlebrush squirreltail, bluebunch wheatgrass, and Indian ricegrass are also common. Birdsfoot sagebrush, low sagebrush, and winterfat are the most common shrubs. Forb species are numerous and include aster, eriogonum, onion, primrose, phlox, pussytoes, and western yarrow. Vegetative cover averages 35 to 45%. Annual production in normal years from excellent condition rangelands averages 350 lbs/ac. A stocking rate of 0.12 AUMs/ac is recommended for rangeland in excellent condition.

Meadows and riparian areas occur in small isolated patches along ephemeral draws and account for less than 1% of the CBGA. Meadow/riparian vegetation primarily consists of 60% grasses and grass-like species, 15% forbs, and 25% woody species (SCS 1988). The dominant grasses are basin wildrye, needle-and-thread grass, and thickspike, slender, and western wheatgrasses. Cottonwood is the dominant woody species, with big sagebrush, box elder, willows, dogwood, and several other species also occurring. The principal forbs include aster, eriogonum, goldenpea, phlox, western yarrow, and fleabane. Vegetative cover is approximately 70 to 80%, and annual production averages 2,300 lbs/ac on excellent condition rangelands in years with normal precipitation. The recommended stocking rate for range in excellent condition is 0.60 AUMs/ac.

3.2.1.2 Wetlands

Wetlands, which are protected under Section 404 of the Clean Water Act (33 CFR 1251 et seq.) and Executive Order 11990, are considered sensitive and valuable resources. Maps produced for the National Wetlands Inventory (NWI) (USFWS 1991) were examined to identify wetlands in the CBGA. Formal wetland delineations have not been performed, and thus, the following discussion only addresses wetland areas as identified from the NWI maps. Wetlands will be evaluated on a site-specific basis for all proposed well locations, roads, and pipelines during the APD or ROW application process. Wetlands would be avoided where possible or mitigated to ensure no net loss of wetlands.

Using the NWI maps, more than 100 wetland sites (approximately 900 acres) were identified throughout the CBGA. Map 3.6 shows the approximate locations of wetlands greater than one acre in size. Wetlands occur in a wide variety of topographic positions, but are most commonly associated with ephemeral drainages, impoundments, and major stream channels. However, there are several playas (ephemeral ponds with no external drainage), reservoirs, springs, abandoned oxbows, and excavated pits in the area that are classified as wetlands on the NWI maps. The largest wetland/floodplain area occurs along Muddy Creek near the town of Dad. In this area, Muddy Creek is classified as intermittent and semipermanently flooded or intermittently exposed (USFWS 1991). The floodplain in this area also contains numerous palustrine wetlands, most of which are classified as palustrine-aquatic bed, palustrine-emergent, or palustrine-unconsolidated shore and are semipermanently, seasonally, or temporarily flooded.



Map 3.6 Wetland Areas, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Reservoirs within the CBGA are classified as either palustrine or lacustrine and are generally semipermanently, seasonally, or temporarily flooded (USFWS 1991). A wide variety of palustrine wetlands occurs in playas, springs, drainages, and oxbows and may be semipermanently, seasonally, or temporarily flooded.

The SCS (1988) indicated that wetland vegetation is composed of 80% grasses and grass-like species, 10% forbs, and 10% woody plants. Tufted hairgrass, northern reedgrass, and Nebraska sedge are the dominant grass and grass-like species. Willow, rose, and water birch are the most common woody species. Forb species include arrowgrass, blue-eyed grass, elephanthead, horsetail, and water hemlock. Cover is high, averaging 85 to 100%, and production in normal years on rangeland in excellent condition averages 5,000 lbs/ac. A stocking rate of 3.0 AUMs/ac is recommended for rangeland in excellent condition.

3.2.2 Wildlife and Fisheries

The topography, soils, water resources, and vegetation on the CBGA provide habitats used by numerous wildlife species as discussed below. Appendix D contains the common and scientific names of animal species known to occur or potentially occurring within or immediately adjacent to the CBGA.

3.2.2.1 Big Game/Other Mammals

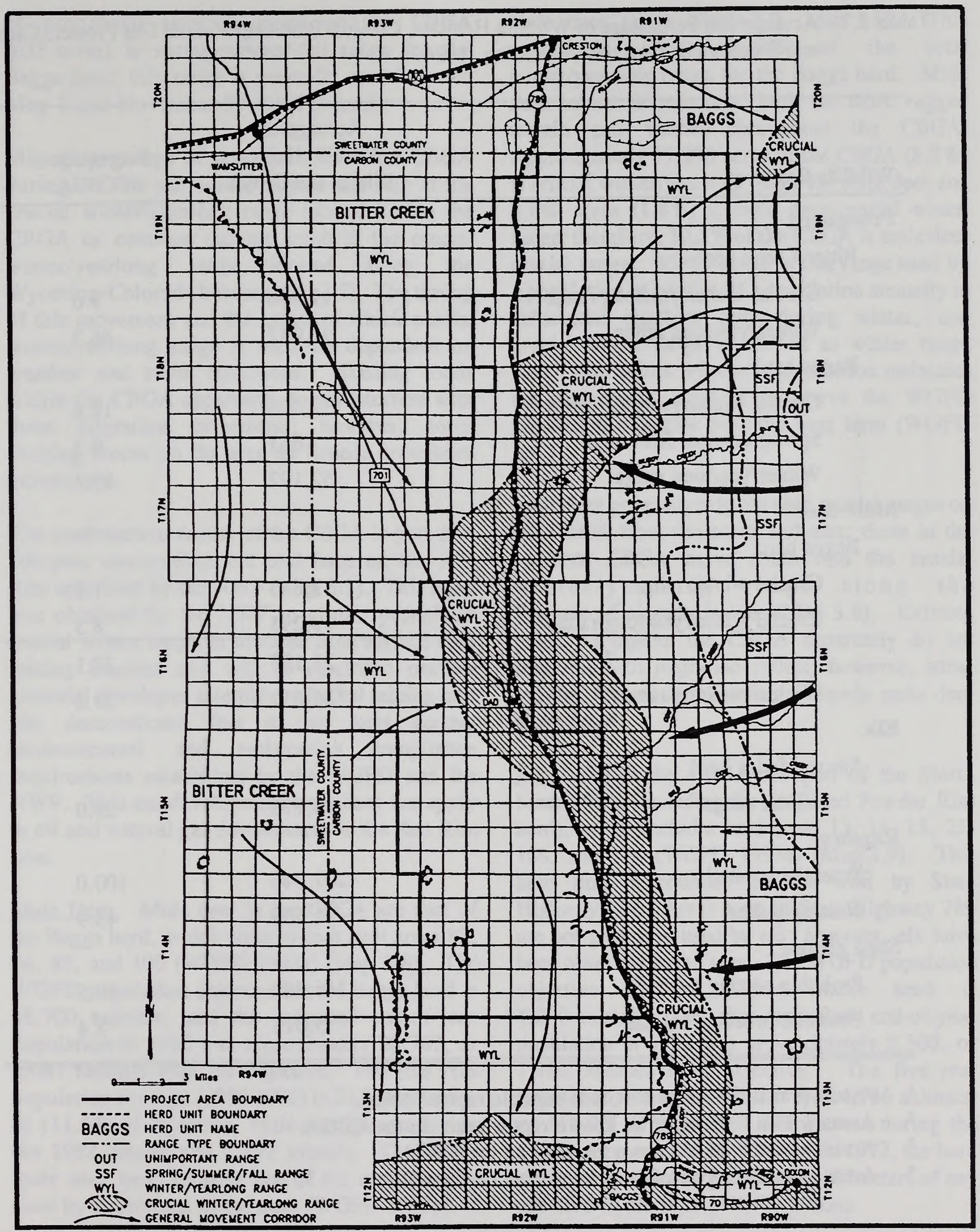
Three big game mammal species occur within or immediately adjacent to the CBGA: pronghorn, mule deer, and elk.

Pronghorn. Pronghorn in the CBGA are part of two herd units, the Bitter Creek and Baggs herds (Map 3.7). The Bitter Creek herd unit includes hunt areas 54, 57, and 58, and occurs on the CBGA west of State Highway 789. The WGFD population objective for this herd is 25,000 animals, and the estimated end-of-year population in 1992 was approximately 22,000, or 88% of the objective (WGFD 1993a). The five year population average (1988-1992) is 19,800 animals, or 79% of objective. The 1992 pronghorn season resulted in the largest harvest on record for the Bitter Creek herd, when 4,122 animals were taken.

The Baggs herd unit, which includes hunt areas 53 and 55, occurs on the CBGA east of State Highway 789 (Map 3.7). The WGFD population objective for this herd is 11,000 animals, and the estimated end-of-year population in 1992 was at the objective (WGFD 1993a). The five year population average (1988-1992) is 10,800 animals, or 98% of objective. The 1992 harvest for the Baggs herd was 2,533 animals. The Baggs herd is not a discrete herd unit since antelope may move across State Highway 789 and Muddy Creek to and from the Bitter Creek herd.

The majority (71.3%) of the pronghorn antelope range on the CBGA is considered winter/yearlong habitat (Table 3.7, Map 3.7). Winter/yearlong range is that range of which a portion is used yearlong, but during winter has a significant influx of animals from other seasonal ranges (WGFD n.d.). The 96,047 acres of winter/yearlong range for the Bitter Creek herd within the CBGA represent approximately 5.9% of the total winter/yearlong range for the herd; likewise, the 52,192 acres of this range type for the Baggs herd on the CBGA represent approximately 17.1% of the total for the herd.

Approximately 28.3% of the CBGA (58,874 acres) is considered crucial winter/yearlong range for pronghorn (Table 3.7, Map 3.7). Crucial winter/yearlong range is defined as winter/yearlong range that has been documented as the determining factor in a population's ability to maintain itself at a desired level over the long term (WGFD n.d.). The 19,866 acres of crucial winter/yearlong range for the Bitter Creek herd represents approximately 10.2% of the total crucial winter/yearlong range for the herd. Approximately 40.3% (39,008 acres) of the crucial winter/yearlong range for the Baggs herd is contained within the CBGA. The remaining 0.3%



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Map 3.7 Pronghorn Herd Units and Range Types, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Table 3.7 Acreage and Percentage of Wildlife Habitats, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Wildlife Resource	Acreage of Wildlife Habitat Within the CBGA	Percentage of CBGA
Pronghorn		
Bitter Creek herd		
Crucial winter/yearlong range	19,866	9.6
Winter/yearlong range	96,047	46.2
Baggs herd		
Crucial winter/yearlong range	39,008	18.8
Spring-summer-fall range	633	0.3
Winter/yearlong range	52,192	25.1
Mule deer		
Baggs herd		
Crucial winter range	3,840	1.8
Crucial winter/yearlong range	17,295	8.3
Total crucial range	21,135	10.1
Winter/yearlong range	186,611	89.8
Elk		
Sierra Madre herd		
Winter range	45,773	22.0
Raptors		
Potential habitat[1]	207,746	100.0
Nesting buffer[2]	91,159	43.9
Sage grouse		
Probable nesting habitat[3]	146,385	70.5
Potential breeding habitat[4]	5,018	2.4

[1] Assumes that the entire CBGA is suitable raptor habitat.

[2] Areas within 0.75 mi of all known raptor nests on the CBGA.

[3] Areas within 2 mi of known lek sites on the CBGA.

[4] Areas within 0.25 mi of known lek sites on the CBGA.

of pronghorn antelope range on the CBGA (633 acres) is spring-summer-fall range for the Baggs herd; this range is generally used between May 1 and November 30 (WGFD n.d.).

Migrating groups of pronghorn enter the CBGA during the fall and winter months and stop at the crucial winter/yearlong range located within the CBGA or continue moving south to the crucial winter/yearlong range located along the Wyoming-Colorado border (Map 3.7). The timing of this movement and the extent to which crucial winter/yearlong range is used are dependent on weather and snow conditions. Existing roads within the CBGA apparently do not interfere with these migration movements; however, some existing fences on the area do impede pronghorn movements.

The northeastern corner of the CBGA is part of a 100 year nondevelopment coal lease on the Red Rim area held by the NWF (Map 3.3). This lease was obtained by the NWF to protect pronghorn crucial winter range in the area from surface coal mining impacts and will be rescinded once a potential developer assembles a logical mining unit and demonstrates that it can meet certain environmental and reclamation compliance requirements established by the WGFD and the NWF. This nondevelopment lease does not apply to oil and natural gas development in the Red Rim area.

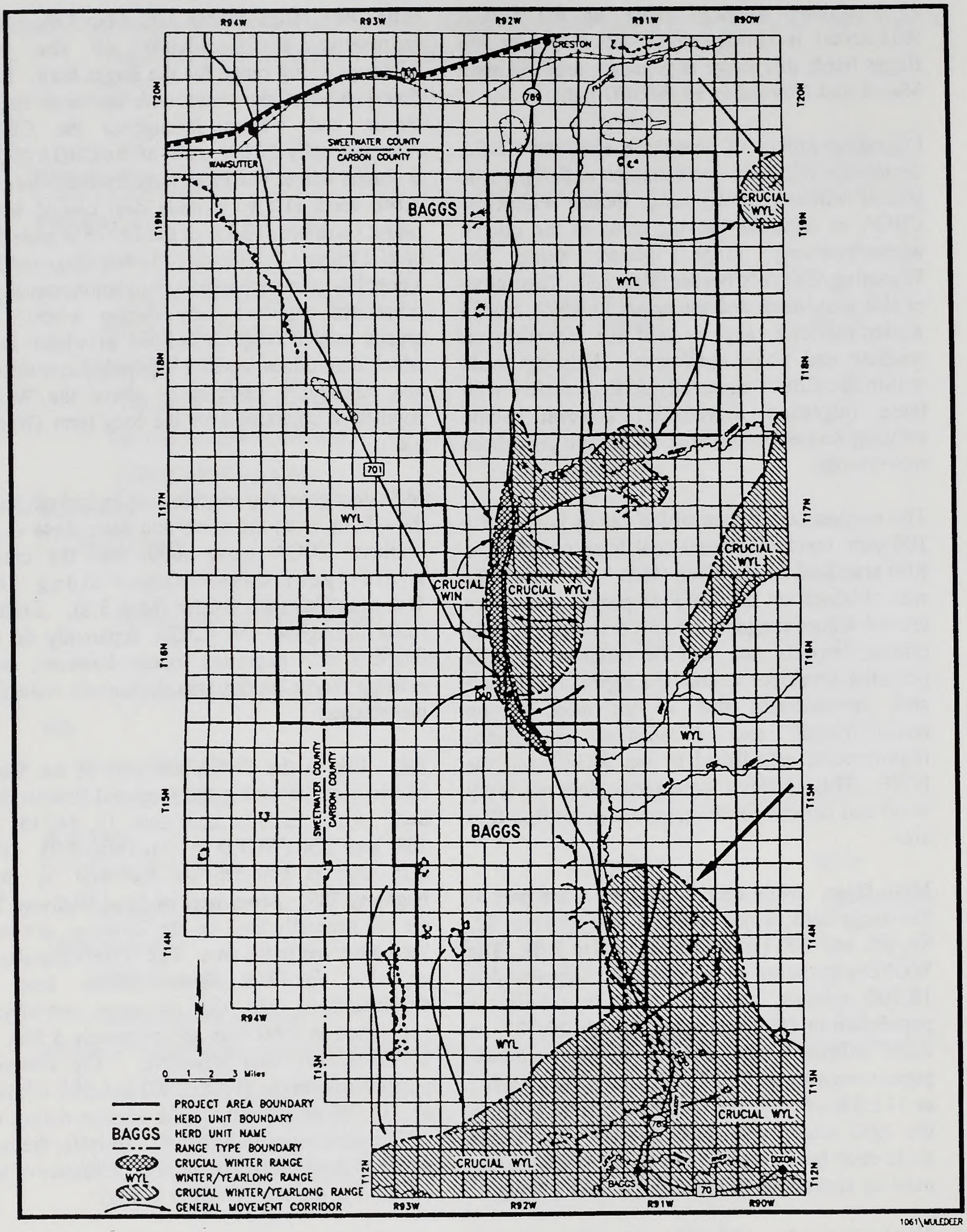
Mule Deer. Mule deer in the CBGA are part of the Baggs herd, which encompasses hunt areas 82, 84, 85, and 100 (WGFD 1993a) (Map 3.8). The WGFD population objective for the Baggs herd is 18,700 animals, and the estimated end-of-year population in 1992 was approximately 20,787, or 2,087 animals over the objective. The five year population average (1988-1992) is 20,862 animals, or 111.6% of objective. Mule deer harvest during the 1992 season was 2,892 animals. The Baggs mule deer herd remains one of the most heavily used by sportsmen in the state (WGFD 1993a).

Approximately 89.8% of the CBGA (186,611 acres) is considered winter/yearlong mule deer range (Table 3.7, Map 3.8). This represents about 13.0% of the total winter/yearlong range for the Baggs herd. Mule deer habitat is associated with the more rugged terrain and washes throughout the CBGA. Approximately 17,295 acres of the CBGA (8.3%) is crucial winter/yearlong range for mule deer and 3,840 acres (1.8%) is mule deer crucial winter range; therefore, 10.1% of the CBGA is mule deer crucial range. Winter range is that range used by a population or portion of a population annually in substantial numbers only during winter, and crucial winter range is defined as winter range which determines whether a population maintains and reproduces itself at or above the WGFD population objective over the long term (WGFD n.d.).

Mule deer generally migrate onto crucial ranges on the CBGA from the north and east; those in the southern CBGA move south into the crucial winter/yearlong range along the Wyoming-Colorado border (Map 3.8). Existing roads throughout the CBGA apparently do not interfere with migration routes; however, some existing fences on the area do impede mule deer movements.

Elk. Elk in the CBGA are part of the Sierra Madre herd (including the proposed Powder Rim herd), which includes hunt areas 13, 14, 15, 21, 108, and 124 (WGFD 1993a) (Map 3.9). This herd unit is bounded on the west by State Highway 789. Areas west of State Highway 789 are not generally used by elk; however, elk have been observed in the area. The WGFD population objective for the Sierra Madre herd is 4,200 animals, and the estimated end-of-year population in 1992 was approximately 5,300, or 1,100 animals over objective. The five year population average (1988-1992) is 4,986 animals, or 118.7% of objective. Elk harvest during the 1992 season was 1,728 animals. In 1992, the herd attracted the third largest number of hunters of any elk herd in the state (WGFD 1993a).

Approximately 22% of the CBGA (45,773 acres) is considered elk winter range (Table 3.7,



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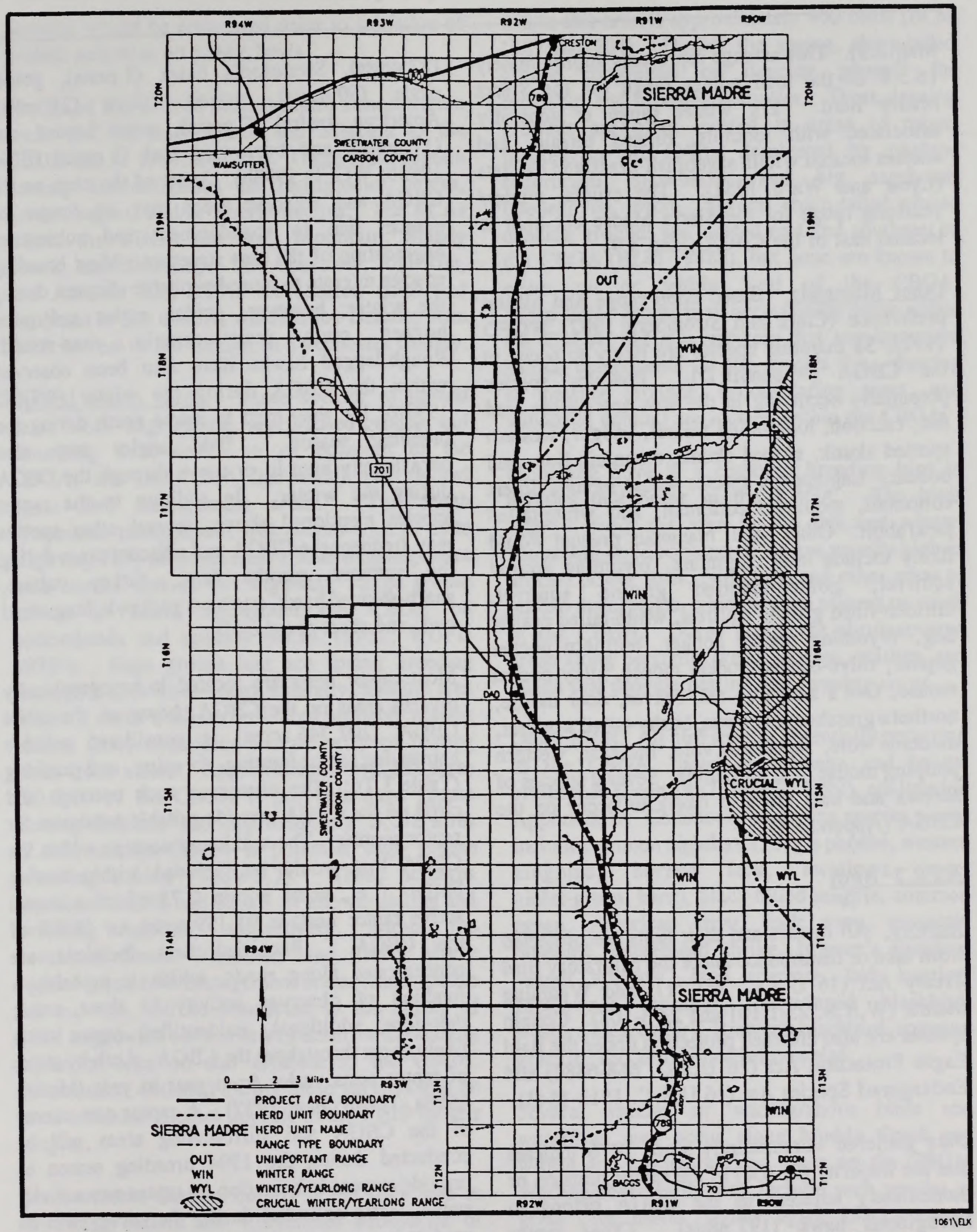
Map 3.8 Mule Deer Herd Units and Range Types, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.



Map 3.9 Elk Herd Units and Range Types, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Map 3.9). This acreage represents approximately 16.5% of the total winter range for the Sierra Madre herd. Elk winter range is generally associated with foothills, rugged terrain, and washes located within sagebrush-grassland habitats (Lyon and Ward 1982). The crucial winter/yearlong range for the Sierra Madre elk herd is located east of the CBGA (Map 3.9).

Other Mammals. Based upon range and habitat preference (Clark and Stromberg 1987; WGFD 1992), 52 mammal species are likely to occur in the CBGA (Appendix D). Predator species potentially occurring in the area are coyote, red fox, raccoon, long-tailed weasel, badger, western spotted skunk, striped skunk, mountain lion, and bobcat. Lagomorph species would include desert cottontail, mountain cottontail, and white-tailed jackrabbit. Other small mammals present would likely include least chipmunk, Wyoming ground squirrel, golden-mantled ground squirrel, thirteen-lined ground squirrel, white-tailed prairie dog, Wyoming pocket gopher, northern pocket gopher, olive-backed pocket mouse, silky pocket mouse, Ord's kangaroo rat, beaver, deer mouse, northern grasshopper mouse, bushy-tailed woodrat, montane vole, sagebrush vole, muskrat, western jumping mouse, and porcupine. Several species of shrews and bats are also likely to occur on the CBGA (Appendix D).

3.2.2.2 Birds

Raptors. All raptors and their nests are protected from take or disturbance under the Migratory Bird Treaty Act (16 U.S.C. 703-711) and Wyoming Statute (W.R.S. 23-1-101 and 23-3-108). Certain species are also afforded protection under the Bald Eagle Protection Act (16 U.S.C. 668-688d) and Endangered Species Act (16 U.S.C. 1513-1543).

Data gathered intermittently since 1976 indicate that the majority (57.6%) of the raptor nests on or immediately adjacent to the CBGA belong to ferruginous hawk (197 nests). Other raptor species that have nested within or immediately adjacent to the CBGA are northern harrier (5 nests), Cooper's hawk (2 nests), red-tailed hawk (32 nests), Swainson's hawk (3 nests), golden eagle (50 nests), prairie falcon (21 nests), American kestrel (7 nests), great horned owl (17 nests), and burrowing owl (5 nests) (BLM 1993b; WGFD 1993b). Some of the nests on the CBGA and adjacent areas may no longer be present due to abandonment and subsequent degradation of the nest structure. Most breeding species migrate to more hospitable climates during the winter; however, golden eagles and great horned owls may remain year-round. Rough-legged hawks have also been observed within the CBGA during the winter (WGFD 1993b), but they tend to move north during the breeding season. Bald eagles may also occasionally hunt in or move through the CBGA during the winter. In addition to the raptor species mentioned above, several other species may frequent the CBGA and adjacent areas during the summer months (e.g., turkey vulture, sharp-shinned hawk, northern goshawk, long-eared owl, and short-eared owl).

Most raptor nests are located in topographically diverse areas on the CBGA; however, the entire CBGA (207,746 acres) is considered suitable habitat for raptor hunting, foraging, and perching (Table 3.7).` The numerous rock outcrops and cliffs on the CBGA provide suitable substrates for raptor nesting. The maximum acreage within the CBGA that would be included within nesting buffers (i.e., areas within 0.75 mi of a known active raptor nest) is 91,159 acres, or 43.9% of the CBGA. Recorded nest locations are concentrated along roads, which is probably a function of observer activity in these areas; therefore, additional, unidentified raptor nests likely occur throughout the CBGA. Activity status of raptor nests varies from year to year (Mariah 1988a, 1988b; Bent 1937). A raptor nest survey of the CBGA and surrounding areas will be conducted during the 1994 breeding season to provide current information on raptor nest activity status. Data collected during the survey will be used to assess potential impacts to raptors in the Final EIS (FEIS) for this project and during site-specific well location reviews (e.g., APDs).

Surveys would be completed prior to initiation of project activities on public lands.

The BLM has defined several raptor concentration areas (RCAs) both within and adjacent to the CBGA (BLM 1987:205-207). These areas contain nesting concentrations of ferruginous hawks, golden eagles, and/or prairie falcons. The RCAs within the CBGA are Doty Mountain, Muddy Creek, and Blue Gap. The Cherokee, Red Rim, and Atlantic Rim RCAs are located north and northeast of the CBGA, whereas the Delaney Rim RCA is west of the CBGA, in Sweetwater County.

Upland Game Birds. Three species of upland game birds--sage grouse, sharp-tailed grouse, and mourning dove--occur on or adjacent to the CBGA, and the CBGA lies within two upland game bird management areas. The South Wamsutter management area occurs west of State Highway 789, while the Sierra Madre management area occurs east of this highway. Sage grouse habitat is found throughout the CBGA on bottomlands and uplands (BLM 1993b; WGFD 1993b). Sage grouse leks are spring breeding areas to which birds return annually, and the area within 2 mi of a lek is considered probable nesting habitat (i.e., containing the majority of nesting birds from a lek). Approximately 146,385 acres (70.5%) of the CBGA is probable sage grouse nesting habitat, and approximately 5,018 acres (2.4%) of the CBGA is potential sage grouse breeding habitat (Table 3.7). These acreages represent 64.5% and 35.6% of known nesting and breeding habitats, respectively, within the combined South Wamsutter and Sierra Madre upland game bird management areas. Sage grouse lek surveys will be conducted in the spring of 1994 to provide current information on the activity status of leks on and adjacent to the CBGA. Information obtained during these surveys will be used to assess project impacts in the FEIS for this project.

Southwestern Carbon County is the only area in Wyoming where the Columbian subspecies of sharp-tailed grouse is known to occur. The population of Columbian sharp-tailed grouse within this area is approximately 400 birds (BLM 1987:202-204). During the spring, sharp-tailed grouse congregate on dancing grounds for courtship and breeding activities. These dancing grounds are often located in areas of mixed shrub-grass-forb habitat dominated by antelope bitterbrush, snowberry, and big sagebrush (Oedekoven 1985). Several sharp-tailed grouse dancing grounds are located east and southeast of the CBGA (BLM 1988b), but none are known to occur on or within 3 mi of the CBGA. Sharp-tailed grouse may occasionally occur within the CBGA, but it is unlikely that any important habitat components for the species (i.e., dancing or nesting grounds, brood-rearing areas, and wintering habitat) are located within the CBGA.

Mourning dove is a common breeding bird in habitats that occur in the CBGA. The birds migrate from the area in the fall and winter. Mourning dove concentrations are usually highest around power lines, buildings, and other areas of human disturbance, which are not present on much of the CBGA. Doves prefer the shrub-covered areas along perennial water sources, washes, and dunes that provide nesting and roosting cover.

Other Birds. All bird species potentially occurring in the CBGA, based upon range and habitat preference (Scott 1987; WGFD 1992), are listed in Appendix D. Commonly occurring species would include common nighthawk, Say's phoebe, western kingbird, horned lark, swallows (e.g., violet-green, barn), black-billed magpie, common raven, American crow, rock wren, mountain bluebird, loggerhead shrike, Brewer's sparrow, vesper sparrow, sage sparrow, lark bunting, McCown's longspur, red-winged blackbird, western meadowlark, Brewer's blackbird, common grackle, and brown-headed cowbird.

Several species of wading/shore birds and waterfowl may occur along Muddy Creek and within and around wetland areas on the CBGA. Wading/shore birds may include such species as great blue heron, snowy egret, black-crowned night-heron, killdeer, and spotted sandpiper. Waterfowl species probably occurring on the

CBGA include pied-billed grebe, American coot, Canada goose, mallard, green-winged teal, northern pintail, blue-winged teal, northern shoveler, gadwall, American wigeon, common merganser, and ruddy duck. Any of these species may occasionally nest within the CBGA.

3.2.2.3 Amphibians and Reptiles

Based on range and habitat preference (Stebbins 1966; Baxter and Stone 1980), five amphibian and five reptile species are likely to occur within the CBGA. Amphibian species include tiger salamander, Great Basin spadefoot, boreal toad, chorus frog, and leopard frog. Amphibians on the CBGA primarily occur in and adjacent to ephemeral, intermittent, and perennial water habitats. Reptile species potentially occurring on the CBGA include sagebrush lizard, short-horned lizard, smooth green snake, Great Basin gopher snake, western terrestrial garter snake, and prairie rattlesnake.

3.2.2.4 Fisheries

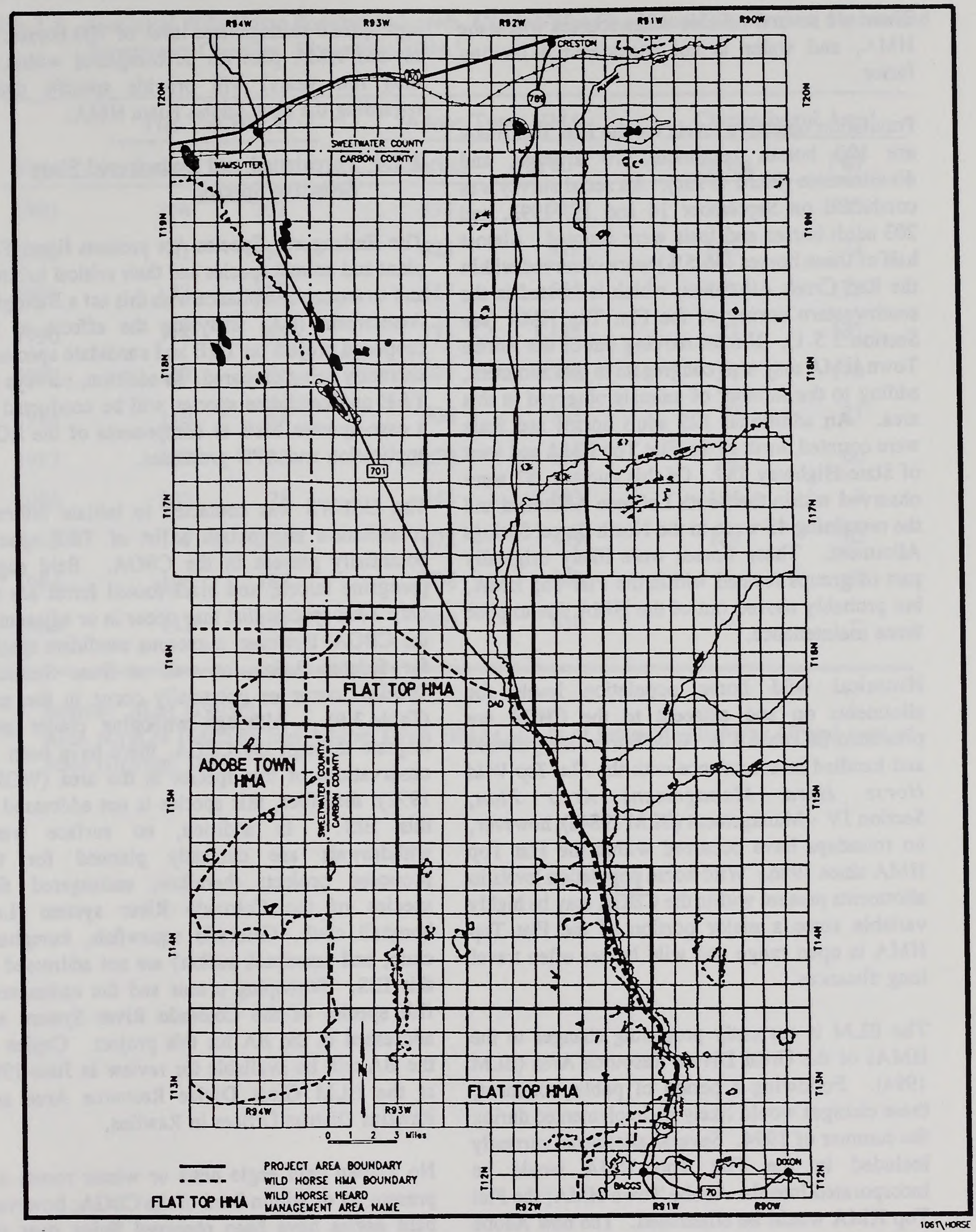
Fisheries in the CBGA are confined to the perennial Muddy Creek, which is a Class 4 stream (WGFD 1991) and a Class 3 surface water (WDEQ 1990). A WGFD Class 4 stream is considered a low production trout water that may be a fishery of local importance, but is generally incapable of sustaining substantial fishing pressure (WGFD 1991). A WDEQ Class 3 surface water is one that supports nongame fish populations only (WDEQ 1990). Muddy Creek, at least in those reaches contained within the CBGA, supports only nongame fish species such as common carp, creek chub, roundtail chub, redside shiner, speckled dace, white sucker, flannelmouth sucker, and mottled sculpin (Baxter and Simon 1970; personal communication, October 1993, with Bill Wengert, WGFD). The remaining streams, draws, and washes within the CBGA are ephemeral/intermittent and do not support fish populations. The Little Snake River, which flows south of the CBGA and into which Muddy Creek drains, is a WGFD Class 4 stream and a WDEQ Class 2 surface water. A WDEQ Class 2 surface water is one that presently supports a game fish population or is capable of supporting a game fish population (WDEQ 1990). Game fish such as rainbow trout, Colorado River cutthroat trout, and brook trout may occasionally pass through reaches of the Little Snake River in the vicinity of Baggs, Wyoming, during periods of high water, but they are more likely to be found in the upstream tributaries of this river (personal communication, October 1993, with Bill Wengert, WGFD). Other game fish species in the Little Snake River include channel catfish and northern pike. Many of the same nongame fish species found in Muddy Creek occur within the Little Snake River. Colorado squawfish and bluehead sucker may also occur in the Little Snake River.

3.2.3 Wild Horses

The Wild Free-Roaming Horses and Burros Act of 1971 prohibits the capture or harassment of wild free-roaming horses and burros on BLM and U.S. Forest Service (USFS) lands. Protected horses and burros are to "be considered...an integral part of the natural system of the public lands", on areas where they were found in 1971 and are to be managed under the multiple use concept (16 U.S.C. 1331-1340, 1976 & Suppl. V 1981; Bean 1983).

The Flat Top Wild Horse Herd Management Area (HMA) occurs in the southwestern portion of the CBGA and encompasses a total area of approximately 240,668 acres in southcentral Wyoming (Map 3.10). Wild horses within the Flat Top HMA are managed by the BLM Great Divide Resource Area (BLM 1984a). The Great Divide Resource Area also manages the Adobe Town HMA, which is located immediately west of the Flat Top HMA, and wild horses occurring north of the two HMAs.

Some movement of horses from the Adobe Town HMA into Flat Top HMA has been noted in recent years, and may have resulted from increased oil and gas activity in the Adobe Town HMA (BLM 1993c). Range condition within the Flat Top HMA is generally considered good (BLM 1984a).



Map 3.10 Wild Horse HMAs, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

There are several reliable water sources within the HMA, and water is not considered a limiting factor.

Population objective levels for the Flat Top HMA are 100 horses maximum, 70 average, and 40 minimum (BLM 1993c). An aerial survey was conducted on September 14 and 15, 1993, and 203 adult horses and foals were counted. Almost half of these horses (46.5%) were observed within the Red Creek Allotment, which is located in the southwestern corner of the Flat Top HMA (see Section 3.5.1). Horses moving out of the Adobe Town HMA may also congregate in this allotment, adding to the number of animals observed in this area. An additional 125 adult horses and foals were counted north of the Flat Top HMA and west of State Highway 789. Of this number, 82 were observed within the South LaClede Allotment and the remaining 43 were in the North Barrel Springs Allotment. These horses were likely originally part of groups located within the Flat Top HMA, but probably moved out of the HMA due to poor fence maintenance.

Historical wild horse population levels for allotments on and adjacent to the CBGA are presented in Table 3.8. Wild horses are gathered and handled in accordance with the *Flat Top Wild Horse Herd Management Area Plan,* Section IV - Management (BLM 1984a); however, no roundups have occurred within the Flat Top HMA since 1986. Wild horse population levels in allotments present within the CBGA may be highly variable since a major portion of the Flat Top HMA is open range and wild horses often travel long distances.

The BLM is currently proposing changes to the HMAs of the Great Divide Resource Area (BLM 1994). Following a period of public comment, these changes would likely be implemented during the summer of 1994. Several allotments currently included in the Flat Top HMA would be incorporated into the Adobe Town HMA; the Flat Top HMA would be eliminated. The new Adobe Town HMA would encompass approximately 472,812 acres and would have a proposed appropriate management level of 700 horses. A revised HMA plan (to be completed within the next few years) will provide specific details regarding the new Adobe Town HMA.

3.2.4 Threatened and Endangered/State Sensitive Species

The Endangered Species Act protects listed T&E plant and animal species and their critical habitats, and to ensure compliance with this act a Biological Assessment (BA) analyzing the effects of the proposed project on T&E and candidate species is currently being prepared. In addition, surveys for T&E and candidate species will be conducted on a case-by-case basis as components of the ROW application and APD processes.

The USFWS was contacted to initiate informal consultation and obtain a list of T&E species potentially present in the CBGA. Bald eagle, peregrine falcon, and black-footed ferret are the only T&E species that may occur in or adjacent to the CBGA; however, numerous candidate species for federal listing, as well as State Sensitive Species, occur or potentially occur in the area (Table 3.9). Although whooping cranes may migrate through the CBGA, there have been no observations of this species in the area (WGFD 1992); therefore, this species is not addressed in this EIS. In addition, no surface water withdrawals are currently planned for the proposed project; therefore, endangered fish species of the Colorado River system (i.e., bonytail chub, Colorado squawfish, humpback chub, and razorback sucker) are not addressed in this EIS. Whooping cranes and the endangered fish species of the Colorado River System are addressed in the BA for this project. Copies of the BA will be available for review in June 1994 at the BLM Great Divide Resource Area and Rawlins District Offices in Rawlins.

No known bald eagle nests or winter roosts are present on or within 2 mi of the CBGA; however, bald eagles have been observed flying over the CBGA (WGFD 1993b). Bald eagles require cliffs or large trees associated with concentrated food

Table 3.8 Historical Wild Horse Population Levels, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

	Flat Top HMA		Adobe Town HMA		Checkerboard Area[2]	
Year	Spring	Fall	Spring	Fall	Spring	Fall
1993	174	202	833	930	151	125
1992	61	180	625	919	106	23
1991	78	118	417	551	161	121
1990	118	83	771	1,185	83	137
1989	139	64	691	761	34	170
1988	110	81	606	363	59	21
1987	109	38	650	665	58	66
1986	202	78	444	683	134	3
1985	147	218	675	489	124	62
1984	196	188	708	903	–	69
1983	112	182	909	610	–	–

[1] Source: BLM (1993c).

[2] Area north of Flat Top and Adobe Town HMAs, south of Interstate Highway 80 and west of State Highway 789.

Table 3.9 Threatened and Endangered and State Sensitive Animal and Plant Species, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Common Name[2]	Location	Date of Last Observation	Status[3]
Mammals			
Black-footed ferret	Potential resident in prairie dog colonies on CBGA.	–	LE, I-WYGF, SH, G1
Birds			
American white pelican	<1.0 mi southeast of CBGA.	June 24, 1989	I-WYGF, S1B, S3N, G3
Bald eagle	Numerous observations both within and adjacent to central and southern CBGA.	March 24, 1992	LE, S1B, S2N, G3
Black tern	Northern CBGA and approximately 4.0 mi SSW of CBGA.	May 25, 1982	C2, II-WYGF, S2B, S3N, G4
Burrowing owl	Numerous observations both within and adjacent to CBGA.	July 11, 1990	II-WYGF, S2, S3B, SZN, G5
Columbian sharp-tailed grouse	Baggs, Wyoming, area and the Little Snake River Drainage.	–	C2, S2B, S2N, G4T2
Ferruginous hawk	Numerous observations both within and adjacent to CBGA.	August 1, 1991	C2, III-WYGF, S4B, SZN, G4
Great blue heron	Several observations both within and adjacent to CBGA.	August 8, 1988	III-WYGF, S4B, S4N, G5
Loggerhead shrike	Several observations both within and adjacent to CBGA.	June 24, 1989	C2, S4B, SZN, G4
Long-billed curlew	Southern CBGA.	April 12, 1987	3C, III-WYGF, S3B, S4N,G5
Mountain plover	Grasslands statewide; potential migrant and/or seasonal resident of CBGA.	–	C1, S3B, S4N, G3
Northern goshawk	Approximately 4.5 mi E of northern CBGA.	June 5, 1987	S4B, SZN, G4
Peregrine falcon	Potential migrant through the area.	–	LE, S1B, S1N, G3T2
Plain titmouse	Approximately 4.5 mi S of CBGA.	June 29, 1982	III-WYGF, S3B, SZN, G5
Snowy egret	Approximately 2.5 mi E of northern CBGA.	June 22, 1980	I-WYGF, S1B, S2N, G5
White-faced ibis	Central CBGA and <0.25 mi and 1.5 mi E of northern CBGA.	April 22, 1992	C2, I-WYGF, S1B, S2N, G5
Whooping crane	Unlikely migrant through the area.	–	LE, SHB, S1N, G1

Table 3.9 (Continued)

Common Name[2]	Location	Date of Last Observation	Status[3]
Fish			
Bluehead sucker	Approximately 5.5 mi SSE of CBGA (Little Snake River).	1956	S3, G5
Bonytail chub	Downstream resident of Green River system.	–	LE, SX, G1
Colorado river cutthroat trout	Little Snake River of CBGA.	–	C2, S2, G5T2T3
Colorado squawfish	Downstream resident of Green River system.	–	LE, S1, G1
Flannelmouth sucker	<0.25 mi E of southern CBGA in Muddy Creek.	August 1967	C2, S3, G3G4
Humpback chub	Downstream resident of Green River system.	–	LE, SH, G1
Razorback sucker	Downstream resident of Green River system.	–	LE, SH, G1
Roundtail chub	Green and Little Snake River Drainages.	–	C2, S2, G3
Plants			
Broad-flowered pincushion	Central CBGA.	June 1977	WYLST 2, S1, G3
Colorado bedstraw	Approximately 9.5 mi W of southern CBGA and approximately 4-11 mi WSW of southern CBGA.	June 28, 1991	WYLST 2, S1, G3G4
Contracted Indian ricegrass	Throughout the CBGA	–	3C, WYLST 2, S2, G4T2
Eastwood sandwort	Approximately 4.5 mi S of CBGA.	July 1967	WYLST 3, S2, G5T4
Fleabane species *(Erigeron consimilis)*	Approximately 11.0 mi SW of CBGA.	June 1968	WYLST 2, S2, G3T3
Gibbon's beardtongue	Approximately 0.5 mi W of CBGA.	August 1989	C2, WYLST 1, S1, G1
Groundsel species *(Senecio spartioides* var. *multicapitatus)*	Approximately 7.0 mi E of CBGA.	August 25, 1981	WYLST 3, S1, G5
Sheepcreek beardtongue	Approximately 2.5 mi W of CBGA.	June 1981	WYLST 3, S2, G4G5
Western hopsage	Approximately 6.0 mi NW of central CBGA.	August 1978	WYLST 3, S2, G4

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[1] Sources: Wyoming Natural Diversity Database (1993a); WGFD (1993b). Personal communications, October 6, 1993, with USFWS, and March 1994 with Mary Reed, BLM.

[2] Names in parentheses are scientific names.

[3] Status definitions as given by the Wyoming Natural Diversity Database (1991, 1993b).

Federal Status:

LE = Listed as federally endangered.

C1 = USFWS Notice of Review, Category 1. Species for which current information supports the biological appropriateness of proposing to list as endangered or threatened, but proposed rules have not yet been issued.

Table 3.9 (Continued)

Federal Status (Continued):

C2 = USFWS Notice of Review, Category 2. Species for which current information indicates that proposing to list as endangered or threatened is possibly appropriate, but insufficient information is on file to support an immediate ruling.

3C = USFWS Notice of Review, Category 3C. Taxa that were once considered for listing as endangered or threatened, but now no longer receive such consideration. Taxa are more widespread or abundant than previously believed, or are not subject to identifiable threats.

State Status:

I-WYGF = Priority I; includes federally endangered and threatened wildlife. Also includes species in need of immediate attention and active management to ensure that extirpation or a significant decline in the breeding population does not occur.

II-WYGF = Priority II; includes species which are in need of additional study to determine whether intensive management is warranted or whether low-level management (such as monitoring population trends) will suffice. Until intensive management is necessary, low-level management will be implemented.

III-WYGF = Priority III; includes species whose needs should be accommodated in resource management planning. However, intensive management programs to maintain or enhance populations are not warranted at present. Populations of these species should be monitored to determine if low levels of management continue to be adequate. Knowledge of some of these species is often very limited.

Wyoming Natural Diversity Database Status:

WYLST 1 = Highest priority; contains: 1) federally listed and proposed T&E species, and Category 1 and 2 candidates for listing (except where current data indicate such status is inappropriate); 2) species designated sensitive on federal lands, or that are being recommended for sensitive designation by the Wyoming Natural Diversity Database; and 3) other species that are (suspected to be) quite rare and/or threatened globally or regionally (significantly disjunct), but that have no formal protective status.

WYLST 2 = Medium priority; contains: 1) species on designated watch lists for federal lands, or that are being recommended for watch lists by the Wyoming Natural Diversity Database; and 2) other species that are (suspected to be) moderately rare and/or somewhat threatened globally or regionally.

WYLST 3 = Low priority; contains: 1) species that were previously considered higher priority for protection, but which have been down-ranked as new information has become available; and 2) species that are rare in Wyoming but common and secure in adjacent areas.

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation within the state.

- S1B = Statewide breeding status of S1.
- S1N = Statewide nonbreeding status of S1.

S2 = Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals) or because of some factor(s) making it very vulnerable to extirpation within the state.

- S2B = Statewide breeding status of S2.
- S2N = Statewide nonbreeding status of S2.

S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences).

- S3B = Statewide breeding status of S3.
- S3N = Statewide nonbreeding status of S3.

S4 = Apparently secure in state with many occurrences.

- S4B = Statewide breeding status of S4.
- S4N = Statewide nonbreeding status of S4.

SH = Historical occurrence in the state, perhaps having not been verified in the past 20 years, and suspected to still be extant. Upon verification of an existing occurrence, SH rank elements would typically receive an S1 rank.

- SHB = Statewide breeding status of SH.

SX = Species apparently extirpated from state.

SZN = Species which are not of significant concern when migrating through or wintering in Wyoming. This includes relatively uncommon migrants in the state with irregular, transitory, or dispersed occurrences. Includes rare species for which important habitats that could be protected are difficult or impossible to define. Also refers to abundant species wintering in, or migrating through, Wyoming.

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extinction.

G3 = Either very rare and local throughout its range, found locally (even abundant at some locations) in a restricted range, or vulnerable to extinction throughout its range.

- G3T2 = Subspecies has G2 status.
- G3T3 = Subspecies has G3 status.
- G3G4 = Status between G3 and G4.

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

- G4T2 = Subspecies has G2 status.
- G4G5 = Status between G4 and G5.

G5 = Demonstrably secure globally and essentially ineradicable under present conditions.

- G5T2T3 = Subspecies have G2 and G3 status.
- G5T4 = Subspecies has G4 status.

sources (e.g., fisheries, waterfowl concentration areas) or sheltered canyons for nesting or roosting areas (Edwards 1969; Snow 1973; Call 1978; Steenhof 1978; Peterson 1986). The lack of such habitat on the CBGA precludes its use for nesting or roosting by the species. Bald eagles, however, have been observed roosting on the area, and winter roosting sites occur along the Little Snake River, approximately 6 mi south-southeast of the CBGA. These birds tend to forage on road-killed deer in the area (personal communication, November 1993, with Bob Oakleaf, WGFD). Migrating bald eagles and those wintering in the Little Snake River drainage may occasionally use the CBGA for foraging; however, such use would likely be intermittent and for relatively short periods.

No known peregrine falcon nests occur on or within 2 mi of the CBGA, nor have any peregrine falcons been reported in the area. Peregrine falcons nest on tall cliffs, usually within 1 mi of a stream or river or extensive brush or woodlands that provide concentrated food sources and open areas to hunt (Snow 1972; Call 1978). The absence of suitable cliffs within the CBGA precludes peregrine falcon nesting, although the area may be used occasionally for hunting by wintering or migrating peregrines.

No confirmed black-footed ferret sightings have been recorded for the CBGA. Black-footed ferret surveys conducted by Postovit (1990) in the central portion of the CBGA resulted in no ferret sightings. However, white-tailed prairie dog colonies are scattered throughout the CBGA and adjacent areas and could provide a potential prey base and habitat for black-footed ferrets. If sufficient acreage and density of prairie dog colonies are present for potential black-footed ferret habitat (as defined in USFWS guidelines [USFWS 1989]) in areas to be disturbed by the proposed project, a search per USFWS guidelines would be made on a well-by-well basis to ensure that ferrets are not present in the area prior to construction activity. Existing information concerning the location and distribution of prairie dog towns within the CBGA indicates that there are numerous clusters of prairie dog colonies scattered throughout the area, and some of these colonies may encompass several hundred acres (personal communication, October 1993, with Bob Luce, WGFD).

Mountain plover, a Category 1 Candidate species, have not been observed within the CBGA but do inhabit areas similar to those present in the area (i.e., upland and lowland grasslands) (Table 3.9). Category 1 Candidate species are those for which the USFWS has sufficient data to list as T&E, but for which proposed rules have not yet been issued.

Five species of birds (i.e., black tern, Columbian sharp-tailed grouse, ferruginous hawk, loggerhead shrike, and white-faced ibis) and three species of fish (i.e., Colorado River cutthroat trout, flannelmouth sucker, roundtail chub) that potentially occur in or adjacent to the CBGA are Category 2 Candidate species (Table 3.9). Category 2 Candidate species are those that are being considered for listing, but sufficient data are not available for a listing decision. Black terns and white-faced ibis frequent freshwater marshes, wet meadows, and aquatic areas in Wyoming (WGFD 1993b); those observed within the CBGA were probably foraging briefly in the area during migration. Columbian sharp-tailed grouse occur east and southeast of the CBGA (see Section 3.2.2.2 Upland Game Birds). Although this species has not been observed in the CBGA, potential habitat (i.e., sagebrush-grassland) does exist in the area, and sharp-tailed grouse may occasionally use eastern portions of the CBGA for foraging. Ferruginous hawks have been observed throughout the CBGA and nest in and adjacent to the area (see Section 3.2.2.2 Raptors). Several observations of loggerhead shrikes both in and adjacent to the CBGA have been recorded, and the species is a fairly common summer resident of the area (WGFD 1992). Loggerhead shrikes likely nest in the CBGA. A flannelmouth sucker was taken from a reach of Muddy Creek immediately southeast of the CBGA in 1967, and the species may still exist in the Muddy Creek drainage. The Colorado River cutthroat trout and roundtail chub are found south of the CBGA in the Little Snake

River, and it is unlikely that either of these species would move up Muddy Creek into the CBGA (personal communication, October 1993, with Bill Wengert, WGFD).

A long-billed curlew, a Category 3C Candidate species, was observed at a pond in the southern CBGA (Table 3.9). Category 3C Candidate species are those that were once considered for listing as T&E but now no longer receive such consideration; they are more widespread or abundant than previously believed or are not subject to identifiable threats. Curlews occasionally use the CBGA for foraging or as a stopover during migration but are probably in the area for only short periods of time.

There are five State of Wyoming Priority bird species that have been observed or could potentially occur within the CBGA: American white pelican, burrowing owl, great blue heron, plain titmouse, and snowy egret (Table 3.9). American white pelicans and snowy egrets, both Priority I species, have been observed east of the CBGA but may occasionally use aquatic habitats within the area during migration for short-term foraging. Priority I species include T&E wildlife, and other species in need of immediate attention and active management to ensure that extirpation or a significant decline in the state's breeding population does not occur. Burrowing owls, a Priority II species, have been observed throughout the CBGA, and use the area for both nesting and foraging. Priority II species are those in need of further study to determine whether intensive management is necessary (low-level management is implemented until the determination is complete). The great blue heron, a Priority III species, has been observed at ponds and streams both within and immediately adjacent to the CBGA; this species is probably a fairly common summer resident of the area. Priority III species are those whose needs should be accommodated in resource management planning, but for which intensive management programs to maintain or enhance populations are not warranted at present. A plain titmouse, another Priority III species, was observed several miles south of the CBGA, and is probably an uncommon visitor to the area (WGFD 1992).

No federally listed T&E plant species are known to occur on the CBGA. A population of Gibben's beardtongue, a Category 2 Candidate species, occurs immediately southwest of the CBGA (Table 3.9). This species favors exposed outcrops of shale or sandstone with slopes generally of 20 to 30 degrees on poorly developed soils. The species experiences little competition from other plants (Dorn 1990; BLM 1992b). Dorn (1990) found that populations of Gibben's beardtongue were stable, and recommended that the status of this plant be downgraded to Category 3C due to the lack of potential threats. Contracted Indian ricegrass, a Category 3C species, occurs throughout the CBGA (personal communication, March 1994, with Mary Reed, BLM, Rawlins). The broad-flowered pincushion, a state sensitive plant species, occurs in the CBGA. This cactus has been assigned a state rank of S1, which indicates that it is critically imperiled in Wyoming because of extreme rarity or some factor(s) making it especially vulnerable to extirpation within the state. In addition, the broad-flowered pincushion occurs on Wyoming Natural Diversity Data Base List 2 (i.e., medium priority), which contains species on designated Watch Lists for federal lands and those that are being recommended for Watch Lists by the Wyoming Natural Diversity Data Base. Six other sensitive species (i.e., Colorado bedstraw, eastwood sandwort, a fleabane species, a groundsel species, Sheep Creek beardtongue, and western hopsage) occur in areas surrounding the CBGA (Table 3.9); none are known to occur within 2 mi of the CBGA, and their presence on the CBGA is unlikely.

3.3 CULTURAL RESOURCES

Cultural resources, which are considered under the National Historic Preservation Act of 1966 and the Archaeological Resources Protection Act of 1979, are the nonrenewable remains of past human activity. The archaeological record of the CBGA has been partially examined through surveys, test excavations, ethnographic materials regarding extant Native American populations, and historic documents pertaining to the settlement and use of the area by Euro-Americans. The Eastern Shoshone and Ute were the primary Native American groups that used the CBGA.

A file search (No. 12,585) performed by the SHPO Cultural Records Office for CBGA lands, and a review of BLM site files and maps available at the BLM Great Divide Resource Area office indicate that numerous previous small-scale cultural resource inventories have been conducted in the CBGA. More than 18,135 acres on the CBGA have been inventoried and surveyed for cultural resources. Information from these inventories provides estimates of the nature and density of prehistoric and historic resources within the CBGA. These inventories included small block areas (40 acres) for well pads, and linear surveys for access roads, pipelines, and seismic lines. However, much of the CBGA has not been inventoried at the Class III level.

Relatively high cultural resource site densities (e.g., 35 sites per section) have been noted in portions of the CBGA. The majority of sites occur on foothills and rims along secondary ephemeral drainages, and many possess northeasterly to southerly aspects. Most occur in association with sand dunes, aeolian sheet deposits, or terraces.

Two basic prehistoric site types--open camps and lithic scatters--have been found within the CBGA. Prehistoric sites have been interpreted to represent short-term occupations with activities focused on the exploitation of local animal, plant, and lithic resources (Current and Pastor 1991). Diagnostic artifacts (e.g., projectile points) from recent cultural resource projects suggest occupation from, at least, the Early Archaic period through the Late Prehistoric period (Figure 3.2). Sites containing ceramics have been recorded in the CBGA.

The BLM has contacted Native American groups known to have used the CBGA to allow them to express their concerns about sites of religious or historical importance to their culture which may be present in the area and could be impacted by the proposed project. No sites of religious or historical importance have been identified by the Native American groups. However, if such sites are identified through additional consultation or survey, they will be treated as confidential information and evaluated with respect to potential impacts on a site-specific basis during the APD and/or ROW application process. Historic use of the CBGA includes ranching, sheepherding, and use of historic trails and roads. Historic sites in the area have been recorded as debris scatters representing stock-herding camps and homesteads. Two intact segments of the Overland Trail, portions of the Rawlins-Baggs Road, and an undefined segment of the Cherokee Trail occur in or adjacent to the CBGA.

3.3.1 Prehistoric Resources

The Washakie Basin appears to have been inhabited by Native American populations since approximately 13,000 years before present (BP). A chronological framework, pertinent to the CBGA, has been established for the Northwestern Plains based mostly on artifact typology (primarily projectile points). Period names are based on Frison's (1978) modification of Mulloy's (1958) framework for Northwestern Plains prehistory (Figure 3.2).

The Paleoindian period is associated with distinctive projectile point styles (e.g., large lanceolate spear tips) and is synonymous with the "big game hunters" who exploited the now extinct megafauna (e.g., bison, mammoth) then present in the area. The Union Pacific Mammoth Site located within the CBGA is a possible paleoindian occupation (Frison 1978; McGrew 1961).

The Early Archaic period is characterized by projectile point styles (e.g., smaller, side- or corner-notched darts) reflecting the exploitation of a broader spectrum of animal resources, with a much diminished utilization of large mammals. Groundstone tools are common, indicating the importance of wild plant resources, and animals

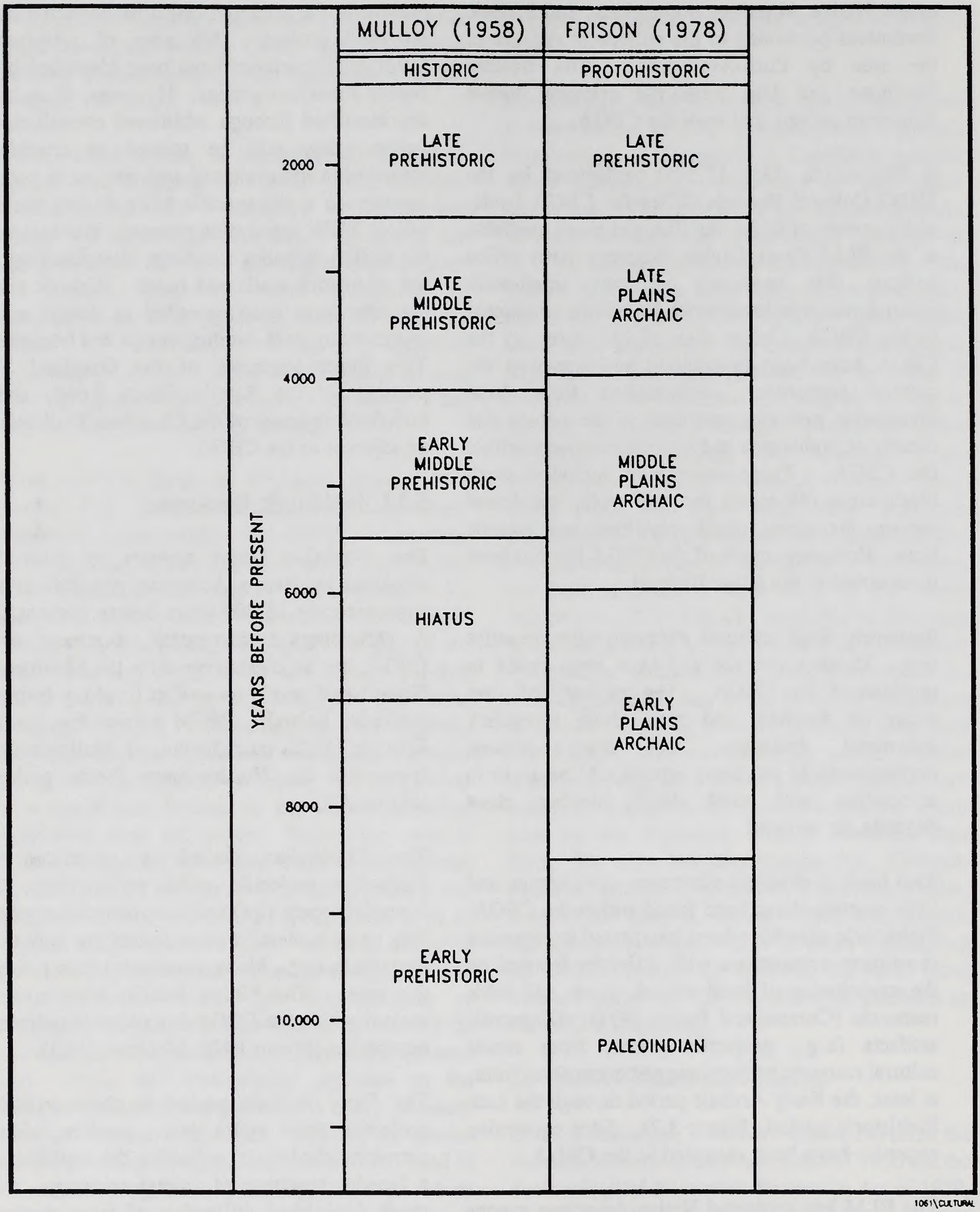


Figure 3.2 Chronological Cultural History Framework for the Northwestern Plains, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

exploited were primarily small mammals such as jackrabbit, cottontail rabbit, and ground squirrel.

The Middle Archaic period is characterized by a variety of indented base, stemmed, or lanceolate projectile points. Generally, in southern Wyoming, this period is characterized by a mixed hunting/plant gathering economy with a reliance on large mammals other than bison (Wheeler et al. 1986). House pits have been investigated at several Middle Archaic period sites, including the Crooks site, which is just north of the CBGA (McKern 1987). Other Middle Archaic period sites in the general area include the Scoggin site; a bison kill, located east of the city of Rawlins (Lobdell 1973); and a short-term dunal camp, located just west of the CBGA (Creasman et al. 1983).

The Late Archaic period is characterized by medium to large corner-notched projectile points. Subsistence patterns of the Late Archaic period are less well-documented than for succeeding and preceding periods in southern Wyoming. Bison and pronghorn appear to have been the primary animals exploited during this period, although smaller animals were used at some sites. Except for the recovery of groundstone implements at a few sites, little information exists concerning the utilization of plant resources in Wyoming. The only components from this phase which have produced significant quantities of charred seeds are from the Taliaferro site (Smith and Creasman 1988).

The Late Prehistoric period represents a period of intensified occupation throughout the region. There is a general switch from a reliance on dart-based hunting technology to the use of the bow and arrow at the beginning of this period. Most Late Prehistoric period sites in southern Wyoming are identified by Rose Spring corner-notched projectile points, small side-notched arrow points, and occasional ceramics. Ceramics, although not common, are generally Fremont types (Bower et al. 1986; Greer and Greer 1989). Crow pottery has been found just northeast of the CBGA (Brox and Miller 1974). Intermountain Ware ceramics are also diagnostic for the period. The Robber's Gulch site, a late prehistoric site containing three human burials (one of which was the result of a murder), occurs within the CBGA (Gill 1991).

Numerous sites of the Late Prehistoric period reflect bison kill or processing activities (Frison 1973, 1978; Latady et al. 1984). Within Wyoming, a broader-based subsistence pattern has been documented, with extensive utilization of seeds from weedy plant species and utilization of a wide variety of large and small game animals. Pronghorn processing sites occurred throughout the Late Prehistoric period (Schroedl 1985; Zier 1982; Zier et al. 1983; Frison 1971). A diverse range of animal taxa was processed at many Uinta sites including the Taliaferro site (Smith and Creasman 1988). Evidence of extensive seed processing activities come from the Taliaferro site (Smith 1988) and Buffalo Hump site (Harrell 1989).

The Protohistoric period corresponds to the arrival of Euro-Americans on the continent, and in Wyoming, this period extended from approximately 450 to 150 years BP (Metcalf 1987). Few Protohistoric sites have been investigated in the area, although surface finds of trade goods are not uncommon.

3.3.2 Historic Resources

The Historic period in the region is represented by five dominant themes, based on the Wyoming Comprehensive Historic Preservation Plan (Massey 1990). These themes are:

- transportation (trails and railroads),
- military,
- industry (mining or mineral extraction),
- agriculture, and
- ethnic groups.

Additionally, six Historic periods are based upon the Wyoming plan (Massey 1990). The six periods are:

- Early Historic ([A.D.] 1800-1842),
- Pre-territorial (1842-1868),

- Territorial (1868-1890),
- Expansion (1890-1920),
- Depression (1920-1939), and
- Modern (1939-present).

Each Historic period may contain any or all of the five historic themes.

Known historic sites within the CBGA consist of the Rawlins-Baggs Road, intact segments of the Overland Trail, stock-herding camps, historic roads and a bridge, an undefined segment of the Cherokee Trail, and homesteads. Most historic sites recorded in the area represent debris scatters of probable stockherder camps. The Washakie Stage Station is adjacent to the CBGA and was listed on the National Register of Historic Places (NRHP) in 1978. It is one of the few remaining stage stations along the Overland Trail at which there are standing ruins.

3.3.3 Identified Cultural Resources

A total of 633 archaeological sites is located within the CBGA. Five hundred sixty (88.5%) of these sites consist solely of prehistoric components, 30 (4.7%) consist of both prehistoric and historic components, and 43 (6.8%) consist solely of historic components. Table 3.10 summarizes the characteristics of the known cultural resource sites in the CBGA.

3.3.3.1 Prehistoric Sites

Of the 560 prehistoric sites within the CBGA, 137 (24.5%) are eligible for inclusion on the NRHP while 256 (45.7%) are ineligible for inclusion (Table 3.10). One hundred sixty-seven sites (29.8%) have no information regarding significance. The majority of eligible prehistoric sites on the CBGA consist of open camps with either intact or potentially intact dateable, subsurface cultural deposits. Most of these sites are located on sand dunes, aeolian sheet deposits, and depositional terraces. A few sites occur on the crest of hills or ridges, with the exception of quarry sites located near Flat Top Mountain. Stone circle sites generally occur below the crests of hills and ridges and on top of ridge spurs. Secondary lithic procurement sites occur on plains and terraces which are overlain by a thin veneer of cobbles and pebbles.

3.3.3.2 Multicomponent Sites

Of the 30 multicomponent sites in the CBGA, 14 (46.7%) are eligible for inclusion on the NRHP, while 12 (40.0%) are ineligible (Table 3.10). Four of the sites (13.3%) have no information regarding eligibility. Prehistoric site components at eligible sites consist predominantly of open camps and are primarily located on sand dunes, aeolian sheet deposits, and terraces. Historic components at eligible sites contain segments of the Overland Trail and herder (sheepherder or stockherder) camps. The majority of herder camps are located on the top of knolls and ridges and are situated on predominantly residual deposits.

3.3.3.3 Historic Sites

Of the 43 historic sites within the CBGA, nine (20.9%) are eligible for inclusion on the NRHP, while 25 (58.1%) are ineligible for inclusion (Table 3.10). Nine sites (20.9%) have no information regarding their potential eligibility. Eligible historic sites predominantly consist of homesteads and trails, including the Overland Trail and the Rawlins-Baggs Road.

3.4 SOCIOECONOMICS

The CBGA is located near the Sweetwater/Carbon County line, and communities in both counties are likely to be impacted by the proposed development. Therefore, socioeconomic data on Carbon and Sweetwater Counties and the towns of Baggs, Rawlins, and Wamsutter are included in this discussion.

Table 3.10 Known Cultural Resources, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

		Eligibility			Site Age			Topographic Location						Depositional Context				
Site Type	#	No	Yes	Unk	Historic	Pre-historic	Multi-component	Lowland	Slope	Upland	Dune	Multiple	Unk	Aeolian	Alluvial	Colluvial	Residual	Unk
Cairns	2	1	–	1	2	–	–	–	–	2	–	–	–	–	1	–	1	–
Ceramic	1	1	–	–	–	1	–	–	1	–	–	–	–	1	–	–	–	–
Cherokee Mine	1	–	–	1	1	–	–	–	1	–	–	–	–	–	–	1	–	–
Dad post office	1	–	–	1	1	–	–	1	–	–	–	–	–	–	1	–	–	–
Herder camps	22	18	2	2	22	–	–	6	3	7	1	–	5	2	3	2	10	5
Herder camp/ windmill/ quarry	1	1	–	–	–	–	1	1	–	–	–	–	–	–	1	–	–	–
Unknown historic	1	–	–	1	1	–	–	–	–	–	–	–	1	–	–	–	–	1
Historic debris	2	2	–	–	2	–	–	–	–	–	–	–	2	–	–	–	–	2
Homesteads	4	–	3	1	4	–	–	2	1	–	1	–	–	1	2	1	–	–
Human burial	1	–	–	1	–	1	–	–	–	–	1	–	–	–	–	–	1	–
Inscriptions	2	–	–	2	2	–	–	–	1	–	–	–	1	–	–	–	1	1
Lithic scatter	150	106	11	33	–	148	2	59	32	35	24	–	–	55	59	28	8	–
Lithic scatter/ herder camp	3	2	–	1	–	–	3	–	–	3	–	–	–	2	–	–	1	–
Lithic scatter/ historic trash	1	1	–	–	–	–	1	–	–	1	–	–	–	1	–	–	–	–
Lithic scatter/ quarry	3	1	–	2	–	3	–	3	–	–	–	–	–	1	1	–	1	–
Lithic source	1	–	–	1	–	1	–	–	–	1	–	–	–	–	–	–	1	–
Muddy Creek bridge	1	–	1	–	1	–	–	1	–	–	–	–	–	–	1	–	–	–
Open camp	377	138	123	116	–	368	9	96	91	91	99	–	–	151	118	91	17	–

Table 3.10 (Continued)

		Eligibility			Site Age			Topographic Location						Depositional Context				
Site Type	#	No	Yes	Unk	Historic	Pre-historic	Multi-component	Lowland	Slope	Upland	Dune	Multiple	Unk	Aeolian	Alluvial	Colluvial	Residual	Unk
Open camp/ herder camp	8	2	5	1	–	–	8	1	2	3	2	–	–	4	2	1	1	–
Open camp/ historic cairn	1	1	–	–	–	–	1	–	1	–	–	–	–	1	–	–	–	–
Open camp/ overland trail	2	–	2	–	–	–	2	–	–	1	1	–	–	1	1	–	–	–
Open camp/ quarries	3	1	2	–	–	3	–	–	1	–	2	–	–	–	1	1	1	–
Open camp/ rock art	1	1	–	–	–	1	–	–	1	–	–	–	–	–	–	1	–	–
Open camp/ trash dump/ trail	1	1	–	–	–	–	1	1	–	–	–	–	–	–	1	–	–	–
Overland trail	1	–	1	–	1	–	–	–	–	–	–	1	–	1	–	–	–	–
Quarries	10	5	4	1	–	10	–	6	3	–	1	–	–	2	2	3	3	–
Rawlins - Baggs Road	1	–	1	–	1	–	–	–	–	–	–	1	–	–	–	–	–	1
Rock shelters	2	1	–	1	–	2	–	–	2	–	–	–	–	–	1	1	–	–
Stone circles	20	6	2	12	–	20	–	1	5	14	–	–	–	4	3	4	9	–
Stone circle/ herder camp	1	–	1	–	–	–	1	–	1	–	–	–	–	1	–	–	–	–
Stone circle/ log cabin	1	–	–	1	–	–	1	–	–	1	–	–	–	–	–	–	1	–
Trash dump	1	1	–	1	1	–	–	1	–	–	–	–	–	–	1	–	–	–
Trash scatters	4	3	–	–	4	–	–	–	–	4	–	–	–	–	–	1	3	–
Unknown prehistoric	1	1	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	1
U.P. mammoth bone bed	1	–	1	–	–	1	–	1	–	–	–	–	–	–	1	–	–	–
Total	633	294	159	180	43	560	30	180	146	163	132	2	10	228	200	135	59	11

3.4.1 Demography

3.4.1.1 Population Dynamics and Census Data

Wyoming's population increased from 332,416 to 469,557 (+41.3%) between 1970 and 1980 as people moved into the state seeking employment in mining, petroleum, and related industries (Table 3.11). Falling mineral prices in the early 1980s slowed the influx of job-seekers and brought significant unemployment. By 1990, Wyoming's population had fallen to 453,588, 3.5% lower than the 1980 level (U.S. Department of Commerce [USDOC] 1992a).

Populations in both Sweetwater and Carbon Counties exhibited even more dramatic growth than Wyoming as a whole during the 1970 to 1981 energy boom, with increases of 126.9% and 64.0%, respectively. The subsequent slump in energy production between 1981 and 1987 substantially increased unemployment in Carbon County, and by 1990, the county's population had decreased 23.9% (Table 3.11). Population decreases between 1980 and 1990 in Sweetwater County (7.6%) were less dramatic than those in Carbon County due to continued high levels of oil and gas exploration and increased demands for soda ash, which is mined in the western portion of the county. Populations in Baggs, Rawlins, and Wamsutter reflected trends similar to the counties in which they are located; the magnitude of changes, however, was generally greater for the smaller communities (Table 3.11).

3.4.1.2 Economic Base and Employment

Carbon County, and Wyoming in general, have experienced serious economic problems since 1981, with losses in employment, population, and personal income. Within Carbon County, overall earnings in the farm sector between 1980 and 1986 declined 64%, while the nonfarm sector declined 28%. Major reductions in the mining and construction sectors were responsible for most of the decline in the nonfarm industries. Small to modest earning increases in services, transportation/utilities, manufacturing, and government were not significant enough to offset large declines in mining and construction (Grafton and Brown 1988).

Sweetwater County has been buffered from the economic decline by trona mining and oil and gas exploration. Five companies refine soda ash from mined trona west of Green River, and several new product facilities are under construction in the area. While trona production did not increase significantly between 1990 and 1991, modest growth is expected over the next few years. Trona prices are also expected to increase slightly over the next five years (Sweetwater Economic Development Association 1992). With the passage of the Clean Air Act Amendments in 1990, mining of low-sulfur coal in Sweetwater County is expected to increase, and several coal companies have recently applied for leases within the county. As oil production continues to decline, natural gas production is increasing (Sweetwater Economic Development Association 1992).

The State of Wyoming's September 1993 labor force (persons 16 years of age and over) was 229,807, with unemployment at 4.3% (Wyoming Department of Employment [WDOE] 1993). In 1980, Carbon County's labor force was 10,346, with an unemployment rate of 3.3%. By September 1993, the county's labor force had decreased to 6,785, with an unemployment rate of 4.5%. Mean family income within Carbon County in 1989 was $35,477 (USDOC 1993).

Sweetwater County's labor force in 1980 was 21,116, with an unemployment rate of 3.7%. By September 1993, the labor force was 20,690, with an unemployment rate of 5.9% (WDOE 1993). Mean family income within the county in 1989 was $43,263 (USDOC 1993). The mining industry has employed the largest number of people (4,475 during the third quarter 1988 through the second quarter 1989) and pays the highest weekly wage ($788 per week) of any employer (Sweetwater Economic Development Association 1992).

Table 3.11 Population Trends for Wyoming, Carbon County, Sweetwater County, Baggs, Rawlins, and Wamsutter, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Location	1960	1970	1960-1970 Trend	1980	1970-1980 Trend	1985	1987	1989	1990	1980-1990 Trend
WYOMING	330,066	332,416	+0.7%	469,557	+41%				453,588	-3%
CARBON COUNTY	14,937	13,354	-11%	21,896	+64%	17,950	16,902	16,629	16,659	-24%
Baggs	199	146	-27%	433	+197%	377	267	–	272	-37%
Rawlins[2]	8,968	7,855	-12%	11,547	+47%	10,662	10,137	9,359	9,380	-19%
SWEETWATER COUNTY	17,920	18,391	+3%	41,723	+127%				38,567	-8%
Wamsutter[2]	110	139	+26%	681	+390%				241	-65%

[1] Source: Grafton and Brown (1988); USDOC (1981, 1992a); Wyoming Department of Commerce (WDOC) 1993.

[2] Annexations were made to these towns and cities.

3.4.1.3 Housing

In 1990, year-round housing units in Carbon County numbered 8,190, with a vacancy rate of 26.7% (2,189 units). Rental unit vacancy rates were the highest, at 21%, while the homeowner vacancy rate was 6%. Of 6,001 occupied units in the county, 72% were family households, and 28% were nonfamily households. Persons per household averaged 2.6 (USDOC 1992b).

Sweetwater County had 15,444 year-round housing units in 1990, with a vacancy rate of 11.8% (1,820 units). Rental unit vacancy rates were 14%, while the homeowner vacancy rate was 3%. Of 13,624 occupied units in the county, 74% were family households, and 26% were nonfamily households. Persons per household averaged 2.8 (USDOC 1992b).

Rawlins had a total of 6,064 housing units during 1992, with approximately 5,600 occupied units (92%) and about 484 vacant units (8%) (personal communication, December 1993, with Barbara Stapleton, Associate Broker, ERA Saulcy Land Co., Inc., Rawlins). Rawlins has 17 hotels and motels (951 rooms) and three RV parks (400 spaces) (WDOC 1993). There are also mobile home parks with a total of approximately 1,280 pads (approximately 50% vacant) (personal communication, December 1993, with Barbara Stapleton, Associate Broker, ERA Saulcy Land Co., Inc., Rawlins).

Housing data for Wamsutter during 1993 show 100 total housing units, with 78 occupied units (78%) and 22 vacant units (22%) (personal communication, December 1993, with Susan Carnes, Town Clerk/Treasurer, Wamsutter). Population decreased from 681 to 241 (-65%) between 1980 and 1990; therefore, housing (i.e., vacant single family, multifamily, mobile home units, and mobile home pads) is available (e.g., two empty trailer courts with a total of approximately 89 pads) (personal communication, December 1993, with Susan Carnes, Town Clerk/Treasurer, Wamsutter). Wamsutter also has two motels (32 rooms) and an RV park with 10 spaces.

Housing in Baggs during 1992 included 137 occupied units (89%) and 17 vacant units (11%) (WDOC 1993). Two motels (52 rooms) and a mobile home/trailer park (69 pads) provide additional temporary housing. A combined total of 523 available housing units in addition to hotels, motels, and mobile home parks are available in Rawlins, Wamsutter, and Baggs.

3.4.2 Infrastructure

3.4.2.1 Public Facilities and Services

The WDOC publishes community profiles for towns throughout the state. The following descriptions of Rawlins and Baggs were based on information presented in community profiles (WDOC 1993). The description of Wamsutter was based on information supplied by Susan Carnes, the Town Clerk/Treasurer, and Linda Lee, the School Secretary.

Rawlins. Rawlins is located along Interstate Highway 80 in central Carbon County. It serves as the governmental and economic hub of Carbon County and has the facility and service structure to accommodate the needs of its worker base and populace. Law enforcement and fire protection are provided by 20 full-time police officers, eight full-time firemen, 20 volunteer firemen, and a 911 emergency number. A City Planning Commission administers zoning regulations and building codes and approves industrial plans (Carbon County Chamber of Commerce 1992).

Rawlins has three elementary schools, a junior high school, and a high school. Western Wyoming College in Rock Springs serves Rawlins through the Carbon County Higher Education Center. Community services consist of a library (60,000 volumes), two day care centers, a senior center, and 16 churches. Commercial services include two shopping centers and a convention facility (1,000 person capacity). Medical care is provided by a hospital (93 beds), a nursing home (48 rooms), eight doctors, five dentists, and an ambulance service. Communications consist of a local daily newspaper, cable TV, two local radio stations and a radio station translator, US West and MCI telephone service, and a first class post office. Recreational resources include six baseball fields, eight tennis courts, a swimming pool, a bike path, four soccer fields, a skating rink, a movie theater, a city recreation center, and eight parks. Outdoor recreation opportunities are present on public lands administered by the BLM around the town and 42 mi southeast in Medicine Bow National Forest, which is administered by the USFS.

Excess capacity exists for electricity, natural gas, water, and wastewater treatment. Solid waste disposal is available at the landfill located north of town. Population decreases during the 1980s (Table 3.11) allow Rawlins' current infrastructure to accommodate an expanded population. Major employers include Union Pacific Railroad Company and local, state, and federal government.

Wamsutter. Wamsutter is a small community located on Interstate Highway 80 in eastern Sweetwater County. The resident population of the community has increased and decreased in response to the boom-and-bust swings of energy development. As a result of the population decrease during the 1980s (Table 3.11), the town has the capacity to absorb and accommodate a fairly large number of immigrants (personal communication, December 1993, with Susan Carnes, Town of Wamsutter, Town Clerk/Treasurer). The town is incorporated and provides its own land use planning.

Wamsutter's law enforcement and fire protection are provided by a full-time City Marshall and approximately 12 volunteer firemen. Additionally, three other law enforcement personnel live in Wamsutter (a Deputy County Sheriff and two Wyoming State Highway Patrolmen). An ambulance service staffed by six Emergency Medical Technicians provides emergency medical care. During the years when its population was relatively high, Wamsutter had a medical clinic, staffed by two doctors and a dentist, who commuted to the town about once monthly; however, the population decline during the 1980s made it impractical to keep the clinic open. The vacant facility still stands and would be available for renewed services if population growth occurred (personal communication, December 1993, with Susan Carnes, Town of Wamsutter, Town Clerk/Treasurer).

Major employers are Colorado Interstate Gas Company, Amoco, Union Pacific Railroad, Highland Enterprises, B&E Trucking, and Desert School. Colorado Interstate Gas Company houses three employee families in Wamsutter, while Amoco employees generally commute from Rawlins. Desert School (Rock Springs School District #1) has 89 pupils presently enrolled in grades K-8 (personal communication, September 1993, with Linda Lee, Town of Wamsutter, Desert School Secretary). High school students are bused to Rawlins to attend classes.

Community services consist of four churches and Desert School, which is used extensively for social, cultural, and recreational activities. A city/county park and two city parks provide opportunities for tennis, basketball, baseball, and volleyball, as well as playground space for children (personal communication, December 1993, with Susan Carnes, Town of Wamsutter, Town Clerk/Treasurer).

Electricity is supplied by Pacific Power and Light Company, while natural gas is supplied by Mountain Fuel Supply Company (personal communication, December 1993, with Susan Carnes, Town of Wamsutter, Town Clerk/Treasurer). The water supply consists of three wells, only one of which is used at any one time due to low demand. Wastewater treatment consists of a three-cell aerated lagoon system with a capacity for a population of 1,500. Solid waste disposal services are provided by the city and include a nearby landfill.

Baggs. Baggs is located 50 mi south of Interstate Highway 80 in the Little Snake River valley along the Wyoming-Colorado border of southern Carbon County. The town was established in the early 1870s, was incorporated in 1910, and has a mayor/council form of government; there is currently no planning commission in Baggs.

Law enforcement and fire protection are provided by a full-time police officer, 13 volunteer firemen, and an emergency 911 number. There is a combined elementary, junior high, and senior high school with 205 students; it is part of Carbon County School District #1.

Community services consist of a library (5,000 volumes), a senior center, and three churches. Health care is provided by a doctor and ambulance service. The town has cable TV and a third class post office. Dubois Telephone Exchange and AT&T provide telephone services. Recreation resources include two baseball fields, a skating rink, and a town park. Hunting, fishing, and other outdoor recreational opportunities are found nearby in the Medicine Bow National Forest and on BLM-administered lands.

Electricity is supplied by Yampa Valley Electric Association and natural gas by Mountain Fuel Supply Company. The town water supply has a maximum daily capacity of 144,000 gpd, and excess capacity is currently available. Wastewater treatment is via a three-cell aerated lagoon system, with capacity for a population of 750. Solid waste disposal is available in a nearby landfill. Population decreases in Baggs during the 1980s allow its infrastructure to accommodate additional population. Dixon and Savery, small towns located east of Baggs along State Highway 70, are dependent upon Baggs for services.

3.4.2.2 Transportation

Surface transportation in Sweetwater and Carbon Counties is provided by a network of primary, secondary, local, and primitive roads. Interstate Highway 80 is the principal roadway linking Carbon and Sweetwater County towns and cities with the rest of southern Wyoming and the national highway system. Both Rawlins and Wamsutter are located adjacent to Interstate Highway 80. State Highway 789, a primary road, runs south from Interstate Highway 80 at Creston to Baggs, providing 36.5 mi of general access to the CBGA. Approximately 43 mi of county and improved gravel roads (e.g., Carbon County Road 701) present in the CBGA link with numerous smaller roads on the area, providing access to most locations within the CBGA. Approximately 536 mi of roads currently exist on the CBGA (Map 1.2). Existing roads in the CBGA are used for recreation, grazing management, and mineral exploration and development.

The main line of the Union Pacific Railroad Company links Rawlins with the major east-west rail line through the central portion of the U.S. Rawlins has a large switchyard for this double-track rail system.

Small community airports are located at Rawlins (runway length 7,700 ft) and Dixon (runway length 7,900 ft), 6 mi east of Baggs. No commercial airlines serve either Dixon or Rawlins; however, charter service is available at the Rawlins Airport (WDOC 1993).

3.4.3 Local Government Revenues

Property taxes collected during 1992 totaled $17,162,365 in Carbon County and $74,559,919 in Sweetwater County (Wyoming Department of Revenue [WDR] 1992). Sales and use taxes (4%) for Carbon County during 1992 totaled $3,681,644, whereas those for Sweetwater County were $14,423,995 during the same year. Carbon County collected $3,297,293 in state severance taxes (6%) on 38,130,623 thousand cubic feet (mcf) of natural gas valued at $58,964,467 in 1992. In the same year, Sweetwater County collected $10,267,113 in state severance taxes on 132,800,868 mcf of natural gas valued at $183,603,610. The State of Wyoming retains approximately 83% of the total state severance tax. The remainder of severance tax monies is returned to the county (personal communication, December

1993, with Richard Marble, Director of the Mineral Tax Division, and February 1994, with Rocky Hopson, Mineral Tax Division, WDR). Ad valorem taxes (6.8%) collected in 1992 on natural gas were approximately $4.0 million and $12.5 million for natural gas produced in Carbon and Sweetwater Counties, respectively. Ad valorem taxes are primarily retained by the county. Approximately $9.5 and $31.7 million in federal mineral revenues were allocated in 1993 to Carbon and Sweetwater Counties, respectively. Federal mineral revenue is the largest revenue source for Carbon and Sweetwater Counties (personal communication, May 1994, Jon Johnson, Natural Resource Specialist, BLM).

3.5 LAND USE

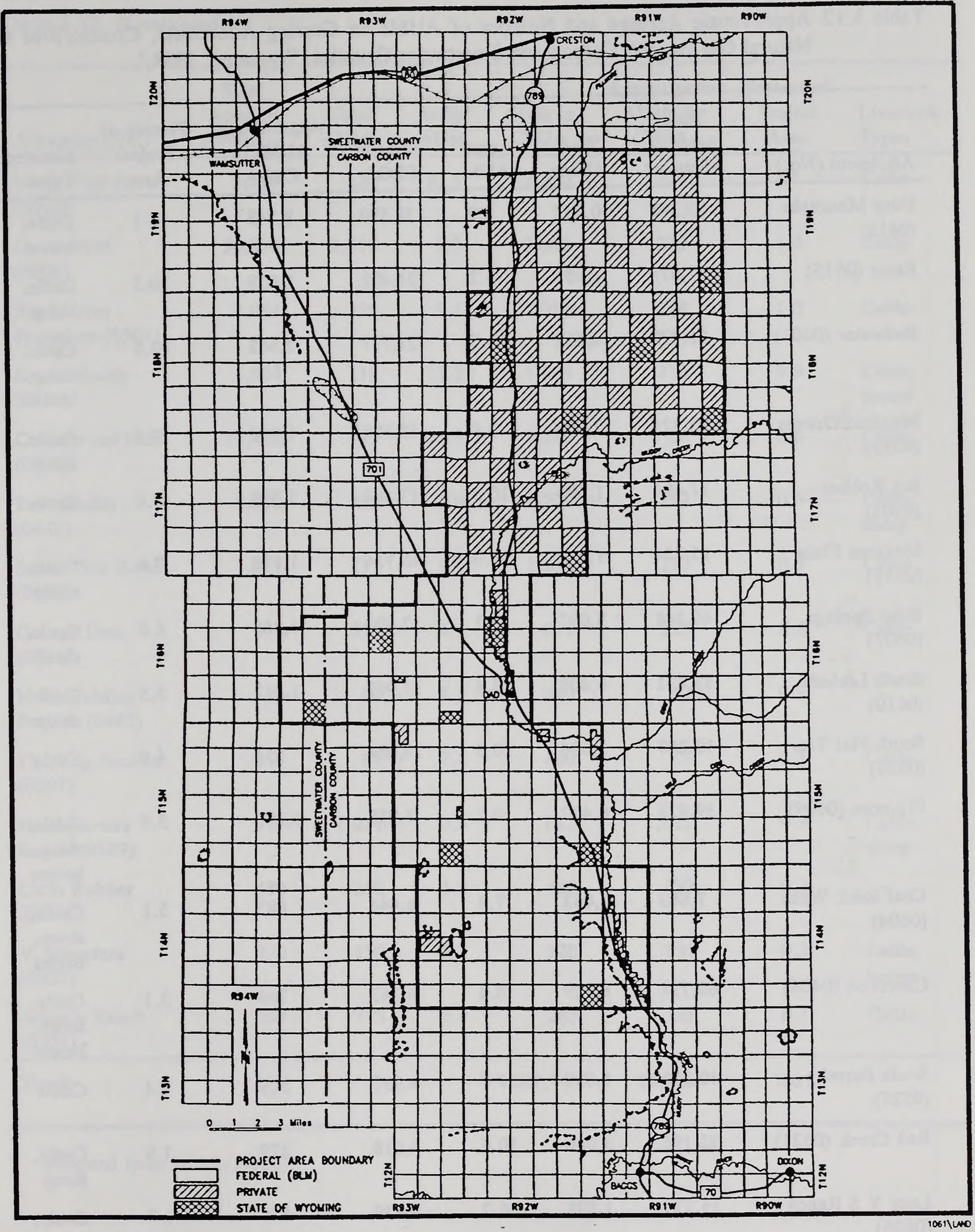
The 207,746-acre CBGA contains approximately 144,497 (70%) federally owned acres; 54,463 (26%) privately owned acres; and 8,786 acres (4%) that are state lands (Map 3.11). The BLM administers federal lands, and the State of Wyoming manages the State School Trust Lands. The entire CBGA is within the BLM Great Divide Resource Area.

Major land uses within and adjacent to the CBGA are agriculture (primarily sheep and cattle grazing); wildlife and wild horse habitat; oil and natural gas exploration, development, and transportation; and dispersed outdoor recreation (e.g., hunting, hiking, camping, wild horse and wildlife observation, nature photography, and ORV use). No developed recreation resources exist within or adjacent to the CBGA.

3.5.1 Agriculture/Rangeland

Due to aridity and limited soil and water resources, livestock grazing represents the major form of agriculture in the CBGA. Small areas adjacent to Muddy Creek are used for limited hay production, and some areas in southwestern portions of the CBGA have been seeded to crested wheatgrass offering improved early season livestock grazing. All or portions of 29 grazing allotments occur in the CBGA (Table 3.12, Map 3.12). Grazing lands in the CBGA provide approximately 26,226 AUMs, and domestic cattle, sheep, and horses are grazed in various combinations throughout the area. Most small livestock operators within the CBGA have cow-calf operations; larger operators usually run yearling operations or combined cow-calf/yearling operations (BLM 1987:117). The season of use is generally yearlong, although some allotments are under seasonal grazing restrictions. Livestock operators in northern portions of the CBGA utilize both public and private land for grazing, whereas those in the south graze their livestock almost entirely on public land.

Five allotments--Doty Mountain, Badwater, Riner, Mexican Graves, and Big Robber--account for over 50% of the acreage on the CBGA (Table 3.12, Map 3.12). The Doty Mountain Allotment is the largest of the five, with a total area of 83,368 acres of federal, state, and private lands supporting 10,512 AUMs for approximately 7.9 acres per AUM (ac/AUM). This allotment covers 29,570 acres (14.1%) of the CBGA and supports approximately 3,743 AUMs on the area. Both cattle and horses are grazed on this allotment. The Badwater Allotment is completely contained within the CBGA and covers approximately 10.5% (21,777 acres) of the area. With 8.2 ac/AUM, this allotment supports 2,662 AUMs within the CBGA. Cattle, sheep, and horses are grazed on the Badwater Allotment. The 57,075 acre Riner Allotment, located in the northernmost portion of the CBGA, supports 6,957 AUMs for approximately 8.2 ac/AUM. This allotment occupies 10.5% of the CBGA (21,802 acres) and contains 2,659 AUMs. Cattle and sheep are grazed on the Riner Allotment. The Mexican Graves Allotment (20,273 acres and 2,054 AUMs) averages 9.9 ac/AUM and occurs on 9.1% of the CBGA (18,808 acres). This allotment contains approximately 1,900 AUMs on the CBGA, and the primary livestock grazed are cattle and sheep. The Big Robber Allotment, which is entirely contained within the CBGA, occupies 17,484 acres (8.4%) of the CBGA and supports 1,693 AUMs (10.3 ac/AUM). This allotment is grazed exclusively by cattle.



Map 3.11 Landownership, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Table 3.12 Approximate Acreage and Number of AUMs on Grazing Allotments, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Allotment (No.)	Total Acres in Allotment	Total AUMs	Acres/ AUM	Acres in CBGA	Approximate AUMs in CBGA	Percent of Project Area	Livestock Types
Doty Mountain (0415)	83,368	10,512	7.9	29,570	3,743	14.1	Cattle, horses
Riner (0615)	57,075	6,957	8.2	21,802	2,659	10.5	Cattle, sheep
Badwater (0601)	21,777	2,662	8.2	21,777	2,662	10.5	Cattle, sheep, horses
Mexican Graves (0516)	20,273	2,054	9.9	18,808	1,900	9.1	Cattle, sheep
Big Robber (0503)	17,484	1,693	10.3	17,484	1,693	8.4	Cattle
Mexican Flats (0515)	15,724	1,738	9.0	15,724	1,738	7.6	Cattle, sheep
Echo Springs (0607)	46,148	5,093	9.1	12,420	1,365	6.0	Cattle, sheep
South Leclede (0610)	53,831	6,408	8.4	11,063	1,317	5.3	Cattle, sheep
South Flat Top (0526)	18,207	1,684	10.8	10,084	934	4.9	Cattle
Fillmore (0609)	39,923	6,422	6.2	8,058	1,300	3.9	Cattle, sheep, horses
Coal Bank Wash (0604)	7,669	1,053	7.3	6,444	883	3.1	Cattle, sheep, horses
Cherokee (0408)	68,728	8,329	8.3	6,343	764	3.1	Cattle, sheep, horses
South Barrel (0525)	10,229	1,037	9.9	4,997	505	2.4	Cattle
Red Creek (0521)	32,196	3,036	10.6	4,018	379	1.9	Cattle, sheep
Lazy Y S Ranch (0626)	11,773	1,898	6.2	3,439	555	1.7	Cattle, sheep

Table 3.12 (Continued)

Allotment (No.)	Total Acres in Allotment	Total AUMs	Acres/ AUM	Acres in CBGA	Approximate AUMs in CBGA	Percent of Project Area	Livestock Types
North Pine Butte (0612)	2,350	224	10.5	2,350	224	1.1	Cattle
Continental (0506)	26,290	2,817	9.3	2,092	225	1.0	Cattle
Big Robber Spreaders (0504)	2,084	228	9.1	2,084	228	1.0	Cattle
South Muddy (0530)	1,804	118	15.3	1,804	118	0.9	Cattle, horses
Cottonwood Hill (0508)	14,448	997	14.5	1,280	88	0.6	Cattle
East Muddy (0443)	5,802	739	7.9	1,202	152	0.6	Cattle, sheep
South Pine Butte (0625)	1,057	217	4.9	1,057	217	0.5	Cattle
George Dew (0531)	871	215	4.1	871	215	0.4	Cattle
H.R. Holding Pasture (0445)	640	90	7.1	640	90	0.3	--
Flat Top Section (0507)	640	87	7.4	640	87	0.3	Cattle
Headquarters Ranch (0529)	612	1,012	0.6	612	1,012	0.3	Cattle, sheep
Little Robber (0514)	480	250	1.9	480	250	0.2	--
V Spreaders (0527)	320	150	2.1	320	150	0.2	Cattle, horses
Adam's Ranch (0501)	283	773	0.4	283	773	0.1	Cattle
Totals				207,746	26,226	100%	

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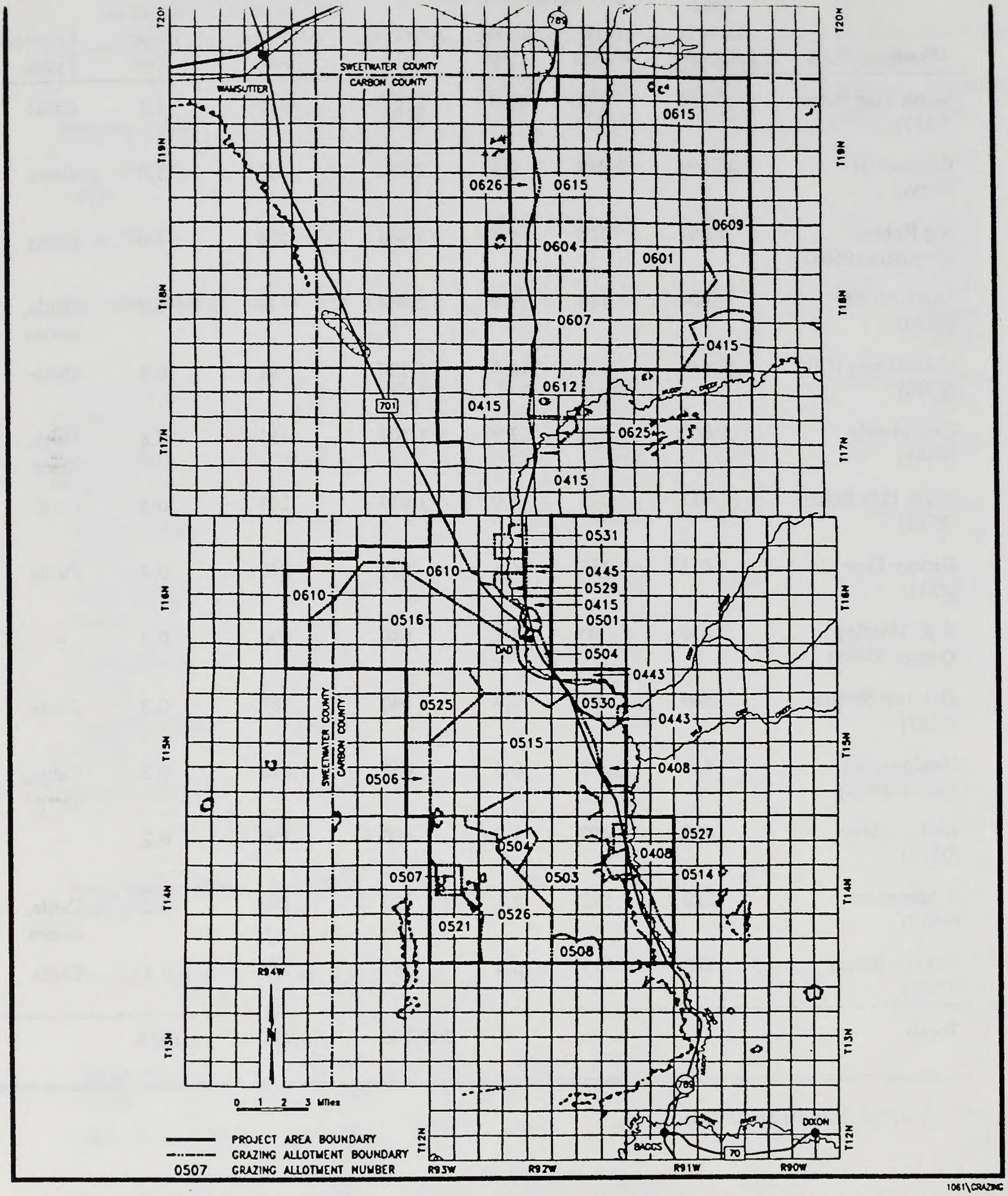
[1] Adapted from BLM (1993d).



Map 3.12 Grazing Allotments, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

3.5.2 Developed Water Resources

Muddy Creek, several perennial reservoirs, numerous ephemeral livestock-watering sources, and stock-water wells are located within the CBGA (see Section 3.1.5).

3.5.3 Extractive Mineral Operations/Oil and Gas Production

There are 134 active, producing natural gas wells within the CBGA, and an additional 105 abandoned or shut-in locations occur in the area (Map 1.2). Gas produced in the area is collected and transported from the area through numerous pipeline systems (Map 1.3). Existing oil and gas operators in the CBGA include SOCO, Amoco, UPRC, and EOG, and most operators produce oil and gas reserves from the Mesaverde Group. Secondary natural gas and oil reserves are produced from the Lewis and Lance Formations at some locations on the CBGA.

Although much of the CBGA is underlain by coal-bearing strata, there are currently no active coal leases within the area. Coal in the area generally has a low sulfur content and may provide an economical coal resource in the future. At present, however, landownership patterns (i.e., the private and public land checkerboard) and the lack of a sufficient transportation network make coal mining in the CBGA uneconomical.

Locatable mineral resources present in and around the CBGA include oil shale and uranium; however, extraction of these resources is currently uneconomical, and no extractive operations for these minerals exist at present. Salable minerals, including gravel, sand, and scoria, are likely to occur in the CBGA but are only of local importance due to high transportation costs. One active gravel quarry occurs in the area (see Section 3.1.3.1).

3.5.4 Recreation

Public land in and adjacent to the CBGA is an important recreational resource for local residents and nonresidents. These areas offer a wide variety of recreational opportunities in diverse settings, including camping, ORV use, snowmobiling, fishing, hunting, and hiking. The checkerboard landownership pattern within the northern CBGA potentially limits access and recreational opportunities on public lands in northern portions of the area; however, public land access is readily available throughout the southern CBGA.

While only limited recreational use data are available for the CBGA, big game hunting is likely the predominant recreational activity. During the 1992 hunting season, 12,871 hunters spent 27,317 recreation days hunting within the Baggs and Bitter Creek pronghorn herd units and the Baggs mule deer herd units combined. The average number of days to harvest a pronghorn ranged from 1.8 (Baggs herd unit) to 2.0 (Bitter Creek herd unit) in 1992; an average of 5.1 days was used to harvest a mule deer in the Baggs herd unit (WGFD 1993). Additional hunting for sage grouse, mourning dove, cottontails, and predators also probably occurs in conjunction with big game hunting and/or other recreational activities. Section 3.2.2 provides further detail on hunting and fishing in the CBGA. No developed recreation sites occur within the CBGA.

3.5.5 Land Status and Prior Rights

There are numerous prior authorizations for the public lands within the CBGA. Land authorizations within the CBGA include natural gas and oil developments and transportation, power, and communications ROWs. Development of natural gas resources under the proposed action would occur only on lands leased or owned by SOCO and the other area operators, and rights to develop other leases on the CBGA would not be violated.

3.6 VISUAL RESOURCES

The visual quality of an area determines its desirability for a specific recreational activity by the public; however, the aesthetic value of the viewshed may also affect, to a lesser extent, other usually less sensitive, nonrecreational users of the land (e.g., public land lessees who graze sheep or cattle, and gas field workers). The preservation of scenery by federal agencies, in balance with responsible development, is central to VRM programs.

The BLM's VRM system is an analytical process that seeks to identify, set, and meet objectives for maintaining scenic values and visual quality. VRM classes represent the degree of acceptable visual change within a characteristic landscape. A class is based on three factors: scenic quality evaluation, sensitivity analysis, and delineation of distance zones, and classes serve as management objectives. VRM classes represent the relative value of the visual resource. Class I and II being the most valued, Class III of moderate value, and Class IV being of least value (BLM 1986). The objectives of the four VRM classes are given in Table 3.13.

Landscapes within the VRM classification system are subdivided into three distance zones (i.e., foreground-middleground, background, and seldom-seen areas) based on relative visibility from travel routes or observation points (BLM 1986). The foreground- middleground zone includes areas seen from highways (e.g., State Highway 789) or other viewing locations that are less than 5 mi away. Areas seen beyond the foreground- middleground zone that are less than 15 mi away are in the background zone. Areas that are not seen in the foreground-middleground or background zones are in the seldom-seen zone.

Forty-five percent of the CBGA is VRM Class III, and the remainder is VRM Class IV (Map 3.13, Table 3.14). The foreground-middleground zone covers approximately 44% of the CBGA, and most of this occurs within Class IV areas. Forty-three percent of the CBGA is within the seldom-seen zone, and most of this occurs within Class III areas. The remaining 13% of the CBGA is within the background zone.

The landscape within the CBGA is topographically diverse (Map 3.1). Rock outcrops are common. Eastern (cedars area) and southwestern (Flattop Mountains) portions of the CBGA, where the most rugged terrain is located, afford vantage points for viewing the surrounding countryside. Rangelands in the CBGA are largely vegetated by grasses, sagebrush, saltbush, and greasewood. Occasional cottonwoods and willows may be found along ephemeral drainages and Muddy Creek, and scattered junipers are present in the southern portions of the CBGA. Several small creeks and washes are found in the area, enhancing its visual quality (Map 3.1).

The proposed Washakie Basin National Natural Landmark, a 525 mi^2 area being considered, in whole or in part, for nomination to the National Registry of Natural Landmarks, is located in the western portion of the CBGA (BLM 1987:104). The landscape within this area is dominated by badlands, buttes, and rims, which impart a high scenic value to the area. Areas approximately 10 mi west of the CBGA within the proposed National Natural Landmark and the Adobe Town Wilderness Study Area have been designated as VRM Class I and II.

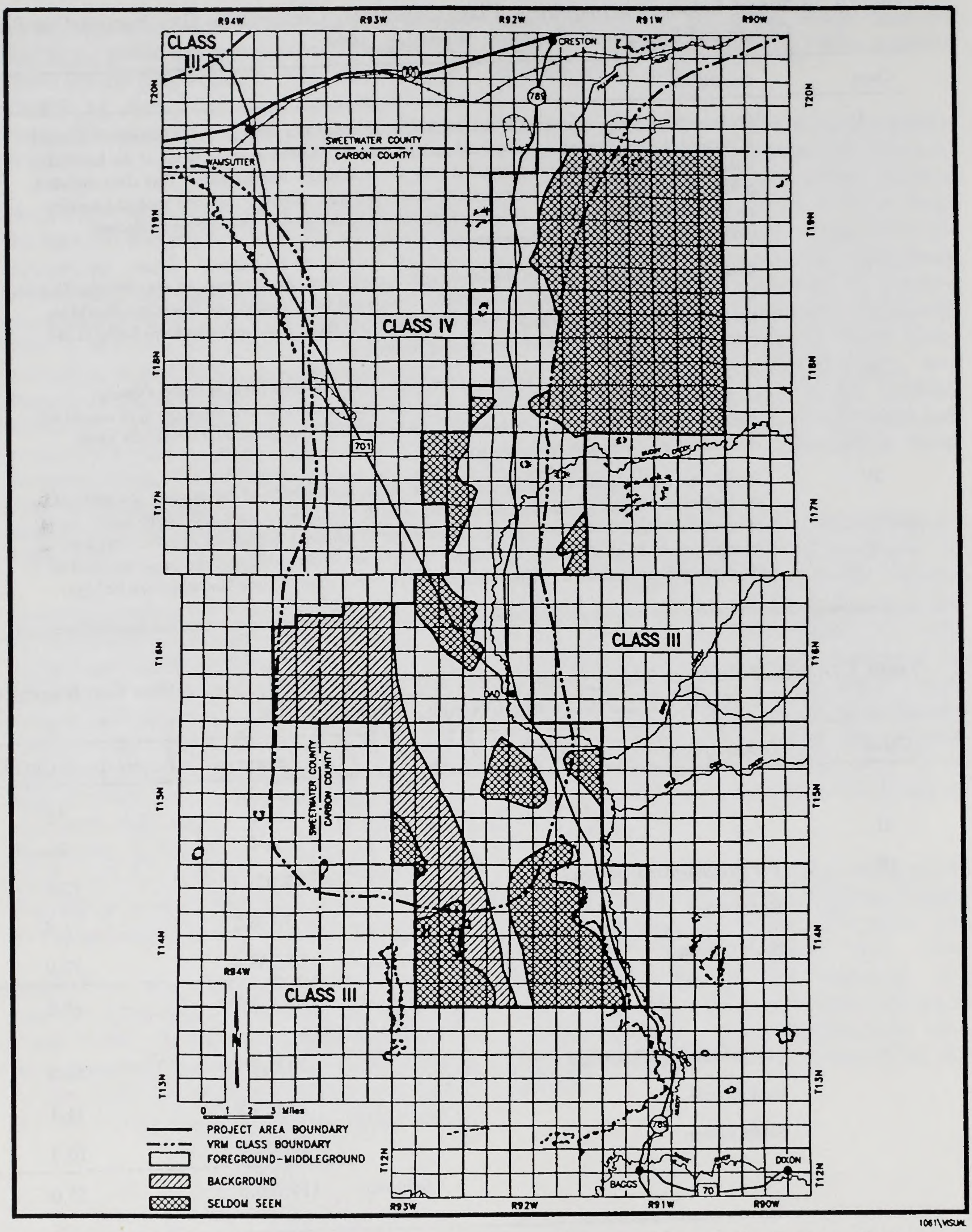
Considerable development activity has occurred within and around the CBGA. Within the CBGA, existing developments include 134 active gas wells, 105 abandoned/shut-in well sites, approximately 536 mi of improved and unimproved roads, and approximately 207 mi of pipeline corridor. These developments have impacted the existing visual resources of the CBGA.

Table 3.13 Visual Resource Management Class Objectives, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Class	Description
I	Preserve the existing character of the landscape; although this class provides mainly for natural ecological change, limited development activity may be allowed in some areas, if the level of change to the characteristic landscape is very low and nearly unnoticeable. This class includes primitive (wilderness) areas, some natural areas, the wild section of national wild and scenic rivers, and other congressionally and administratively designated areas where landscape modification activities are to be restricted.
II	Retain the existing character of the landscape; management activities may be seen but should not attract the attention of the casual observer. Changes to the characteristic landscape should be low, and changes must repeat the basic elements (i.e., form, line, color, texture) found in the predominant natural features of the existing landscape.
III	Partially retain the existing character of the landscape; moderate changes to the existing landscape are allowed, although management activities associated with these changes should not dominate the view of the casual observer. As in Class II, changes should repeat the basic elements of the characteristic landscape.
IV	Provide for management activities that require major modification of the existing character of the landscape. Although management activities may dominate the view and be the major focus of viewer attention, every attempt should be made to minimize the impact of these activities through careful location selection, minimal disturbance, and repetition of the basic elements of the characteristic landscape. The relative change to the characteristic landscape can be high.

Table 3.14 Visual Resource Management Classes and Distance Zones, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Class	Distance Zone		Acreage	Percentage of CBGA
I	--		0	0
II	--		0	0
III	Foreground-Middleground		22,021.1	10.6
	Background		3,116.2	1.5
	Seldom-Seen		68,348.4	32.9
		Subtotal	93,485.7	45.0
IV	Foreground-Middleground		70,218.2	33.8
	Background		23,059.8	11.1
	Seldom-Seen		20,982.3	10.1
		Subtotal	114,260.3	55.0
		Total	207,746	100.0



Map 3.13 Visual Resource Management Areas, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Environmental consequences of construction, drilling, completion, operation, and maintenance of the proposed Creston/Blue Gap Natural Gas Project are discussed below for each affected resource under each alternative. Discussions of impacts that can be reasonably expected from project implementation are included, and mitigation measures and residual impacts are discussed where appropriate. Projectwide mitigation measures, presented in Section 2.1.5, are part of the proposed action and alternatives, and impact analyses assume that these mitigation measures would be effectively implemented. Additional mitigation measures are recommended for some resources to further minimize impacts; however, the BLM lacks authority to enforce some of these measures on private lands. Nevertheless, SOCO and the other area operators have committed to implementing the proposed project with public safety and environmental consciousness throughout the CBGA and for the LOP insofar as landowner preference and agreement allow.

An environmental consequence or impact is defined as a modification in the existing environment brought about by development activities. Impacts can be beneficial or adverse, can be a primary result of the action (direct) or a secondary result (indirect), and can be permanent or long-lasting (long-term) or temporary and of short duration (short-term). Impacts can vary in degree from only a slightly discernible change to a total change in the environment.

Short-term impacts are effects on the environment that occur during and immediately after the conclusion of construction, drilling, completion, and testing activities. Although short in duration, such impacts are normally obvious and disruptive. For this project, short-term impacts are defined as lasting five years or less. Long-term impacts are changes made in the environment during construction and operation of the project that remain longer than five years. Impacts that remain for the LOP and after reclamation has been accomplished would be considered long-term.

Potential impacts for this project were classified into five levels: significant, moderate, negligible, no impact, and beneficial. Significant impacts (as defined in CEQ guidelines 40 CFR 1500-1508) are effects that are most substantial and therefore should receive the greatest attention in decision making. Impact significance criteria are given for each affected resource. These criteria have been established based on existing regulatory standards, scientific and environmental documentation, and/or the professional judgement of resource specialists. Moderate impacts do not meet the criteria to be classified as significant but nevertheless result in a degree of change that is easy to detect. Impacts classified as negligible cause little effect or no effect to the existing environment and cannot be easily detected. Beneficial impacts are those that provide desirable situations or outcomes, while undesirable impacts are those that do not. In the following discussion, impacts are considered undesirable unless identified as beneficial.

Cumulative impacts are those that result from the incremental impacts of the proposed project added to past, present, and reasonably foreseeable future actions. Cumulative impacts are described below for each resource. Past use of the CBGA has included wildlife habitat, livestock grazing, gas and oil development and production, recreation, and transportation. These uses continue through the present and are anticipated to continue into the reasonably foreseeable future. Assessment of cumulative impacts in this EIS is based upon existing information available for past, present (i.e., the proposed project), and reasonably foreseeable developments in the CBGA, including appropriate information on existing and proposed oil and gas development activities in the Greater Wamsutter Analysis Area (GWAA) (BLM 1992a) and the Mulligan Draw Project Area (MDPA) (BLM 1992c, 1992d). Additional developments proximal to the project area but outside the

CBGA, GWAA, and MDPA are known to occur, but since the extent of these developments is unknown they are not quantified in this EIS.

The extent of existing and proposed surface disturbance within the CBGA under the proposed action and Alternatives 1 and 2 is presented in Tables 2.1 and 4.1. In summary, existing disturbance within the CBGA totals approximately 4,304 acres, whereas disturbance resulting from the proposed action and alternatives would range from 878 to 1,248 acres initially and 393 to 667 acres for the LOP. The maximum total acreage disturbed by the proposed project for the LOP (Alternative 2) would be 2,695 acres and includes 2,028 acres of existing disturbance (Table 2.1). Reasonably foreseeable future development in the CBGA as identified by the existing area operators is estimated to include an additional 900 well locations (Table 4.1). Total existing, proposed, and reasonably foreseeable future development in the CBGA is estimated to include 1,439 well locations for a total disturbance area of 6,972 acres.

The no action alternative would require the BLM to deny approval of the surface disturbance associated with the proposed action and alternatives. Additional wells would not be drilled, and roads, pipelines, and ancillary facilities would not be constructed, thereby precluding the recovery of gas and oil reserves. The no action alternative would be limited to federal surface or minerals, but the amount and location of nonfederal surface or minerals could effectively prohibit the development of gas and oil from the entire CBGA due to access and economics. This alternative would essentially maintain the existing condition of the environment on the CBGA. No immediate impact to the existing environment would occur because no additional ground would be disturbed; however, existing leases on the area would be violated (see Section 4.1.3.5).

Impacts of the proposed action, Alternatives 1 and 2, and no action, and mitigations for development activities are summarized in Table 2.6 and discussed in detail below.

4.1 PHYSICAL RESOURCES

4.1.1 Air Quality

4.1.1.1 Significance Criteria

Impacts to air quality would be considered significant if project activities result in a violation of federal and/or state air quality attainment standards (WDEQ 1989).

4.1.1.2 Proposed Action

Short-term increases in particulate dust and trace gas emissions would result from construction, drilling, and venting and flaring activities. Dust from traffic on roads would be an impact for the LOP; however, the CBGA is characterized by persistent strong winds that help disperse pollutants.

Because the quantities of pollutants produced by the proposed action would be small and because climatic characteristics of the CBGA help disperse pollutants, impacts to air quality from construction, drilling, and completion activities would primarily be short-term and negligible. Regular equipment maintenance, including emissions checks, and regularly maintaining roads would further limit impacts to air quality.

Hydrocarbons, NOx, CO, CO_2, and sulfur dioxide (SO_2) emissions in the CBGA would temporarily increase at some locations from the operation of drilling and construction equipment, vehicles, flaring and/or venting of gas, and emissions from compression facilities. Natural gas from the target formations does not contain H_2S, and therefore, no H_2S health hazard would be present. No CO_2 emissions exceeding suggested health practice standards (5,000 ppm annual average [American Council of Governmental Industrial Hygienists 1980]) would occur.

Table 4.1 Cumulative Disturbance, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Location	Total Acreage	Number of Well Locations	Acreage Disturbed	% Disturbed
CBGA	207,746			
Existing		239	4,304	2.1
LOP[2]		300	667[3]	0.3
Reasonably foreseeable future development		900	2,001	1.0
	Subtotal	1,439	6,972	3.4
MDPA[4]	47,287	45	350	0.7
GWAA[5]	295,791	44	172	0.1
Total	550,824	1,528	7,494	1.4

[1] Includes only those disturbances identified for the CBGA, GWAA, and MDPA. Additional disturbance proximal to the project area, but outside the CBGA, GWAA, and MDPA are known to occur; however, since the extent of these developments is unknown it is not included herein.

[2] Adapted from Alternative 2, which identifies the maximum levels of development proposed in this EIS.

[3] Includes all LOP disturbance from wells, roads, pipelines, and ancillary facilities.

[4] As proposed in BLM (1992c, 1992d).

[5] As proposed in BLM (1992a).

Activities associated with the proposed action would not exceed Class II PSD increments, National Ambient Air Quality Standards, or Wyoming Ambient Air Quality Standards; and therefore, impacts to air quality would be moderate during construction and negligible for the LOP. Air quality permits to construct, test, and operate facilities would be obtained from the WDEQ-AQD, as necessary.

4.1.1.3 Alternative 1

Because similar mitigation measures would be used under Alternative 1 as under the proposed action, impacts under this alternative would be moderate during construction and negligible for the LOP. In addition, since 75 fewer wells would be drilled and completed and 75 fewer locations would be constructed, potential air quality impacts would be reduced by approximately 30%.

4.1.1.4 Alternative 2

Although 50 additional well locations and 55 additional wells would be developed under Alternative 2, the application of mitigation measures, as identified for the proposed action, would be employed, thereby limiting impacts under this alternative to moderate levels during construction and negligible levels for the LOP. None-the-less air quality impacts would be increased by approximately 20% under this alternative.

4.1.1.5 No Action

Under the no action alternative, there would be no incremental increase in air quality impacts from the proposed project since no additional development would occur.

4.1.1.6 Cumulative Impacts

Cumulative impacts to air quality due to oil and gas development operations in the CBGA, MDPA, and GWAA would be moderate during construction and negligible for the LOPs. Total disturbance in these areas would total approximately 7,494 acres which amounts to 1.4% of the combined areas (Table 4.1). With the dissipating capabilities of wind throughout the region, and the employment of mitigation measures designed to minimize fugitive dust emissions, standards for particulate concentrations would not be exceeded.

Regular maintenance of internal combustion engines, including compressor stations, would further minimize cumulative air quality impacts resulting from project operations. Because none of the areas individually would be in nonattainment of federal air quality standards, and because the actual area of disturbance is small compared with the total development area (approximately 1.4% of 550,824 acres) (Table 4.1), the combined project areas would remain within federal and state air quality standards.

4.1.2 Topography/Physiography

4.1.2.1 Significance Criteria

Impacts to topography and physiography would be considered significant if disturbance permanently affects prominent landforms or surface drainage patterns. These criteria are consistent with drainage protection goals established in the BLM Great Divide Resource Area RMP (BLM 1987:61-63).

4.1.2.2 Proposed Action

The primary impacts to topography and physiography resulting from the proposed action would be changes to the landscape due to cut and fill activities used to level well locations and to make roadbeds. Road and pipeline stream crossings also have the potential for impacting surface drainage. The maximum new cut and fill disturbance required for the proposed action would total 1,248 acres (0.6%) within the CBGA (Table 2.1).

None of the proposed development activities would require moving large amounts of earth, and no prominent landforms would be destroyed. Roads would be constructed following specifications in Section 9113, road standards manual (BLM 1985, 1991a), which requires restoration of surface drainage patterns with culverts, ditches, or other means during construction. Pipelines would be constructed using standard industry practices, which include provisions for stream crossings and channel restoration. Therefore, impacts to topography and physiography would be negligible for the LOP. Because all facilities would eventually be reclaimed, there would be no permanent impacts.

4.1.2.3 Alternative 1

No significant impacts to topography and physiography would occur under Alternative 1, and impacts would be similar to those for the proposed action but reduced by approximately 30%. New cut and fill disturbance under Alternative 1 would total approximately 878 acres, and total LOP disturbance, including 1,186 acres of existing disturbance, would be 1,579 acres (or less than 1% of the CBGA) (Table 2.1).

4.1.2.4 Alternative 2

No significant impacts to topography and physiography would occur under Alternative 2, and impacts would be similar to those for the proposed action but increased by approximately 20%. New cut and fill disturbance under Alternative 2 would total approximately 1,496 acres, and total LOP disturbance would be 2,695 acres or 1.3% of the CBGA (Table 2.1).

4.1.2.5 No Action

No significant impacts would occur under the no action alternative. Existing disturbance on the CBGA totaling 4,304 acres (2.1% of the area) would continue for current CBGA land uses.

4.1.2.6 Cumulative Impacts

Cumulative impacts to topography and physiography in the CBGA and surrounding areas would occur from existing, proposed, and potential future oil and gas development projects. Disturbance from existing well locations, roads, pipelines, and facilities within the CBGA totals 4,304 acres (Table 4.1). The proposed project would disturb a maximum (under Alternative 2) of 667 additional acres for the LOP, and potential future oil and gas development in the CBGA (900 locations) could further disturb another 2,001 acres; therefore, total potential cumulative disturbance in the CBGA could be 6,972 acres or 3.4% of the area. LOP disturbance for the MDPA is projected to be 350 acres (BLM 1992c), while disturbance in the GWAA is expected to be 172 acres (BLM 1992a). Total cumulative regional disturbance, therefore, could be 7,494 acres from existing disturbances combined with proposed and reasonably foreseeable future oil and gas development. This disturbance would amount to 1.4% of the total acreage (550,824) in the CBGA, MDPA, and GWAA combined.

Although there is widespread oil and gas development in the region, standard stipulations for construction and reclamation would be implemented, and thus, there would be no significant cumulative impacts to topography or physiography. Surface drainage patterns would be maintained, and reclamation procedures would include regrading and recontouring disturbed areas to approximate original conditions.

4.1.3 Mineral Resources

4.1.3.1 Significance Criteria

Impacts to mineral resources would be considered significant if a specific resource is depleted or if access to economically recoverable resources is restricted by the proposed project. The first criterion ranks as significant because resources used today are not available to meet future energy needs. The second criterion is consistent with mineral management goals specified in the Great Divide Resource Area RMP (BLM 1987:48-57).

4.1.3.2 Proposed Action

The depletion of recoverable gas and oil reserves from the Mesaverde Group and other formations underlying the CBGA would be significant. An estimated 178,213 mmcf of gas and 1,782 mbbl of oil (i.e., condensates) would be recovered and would not be available for future energy needs. The purpose of the proposed project is to recover existing natural gas and oil reserves and put them to beneficial use, and current national energy demands necessitate continuous recovery of fossil fuels; therefore, while the impact would be significant, it would be beneficial, and no mitigation would be applied.

Because there is no coal mining occurring in the CBGA and the potential for future coal mining is low, the proposed action would have a negligible impact on coal recovery. The CBGA is located within the Little Snake River valley Known Recoverable Coal Reserve Area, and thus, there is some potential for future coal mining, especially in the China Butte coal area (Map 3.3). Oil and gas development in portions of the CBGA would preclude coal mining for the LOP and possibly beyond. However, coal mining within the CBGA is already precluded by existing oil and gas developments, and future oil and gas development in the CBGA is expected (BLM 1987:122-125).

The only known mineral extraction operation in the CBGA is a gravel quarry, and gravel from this quarry may be used for development and maintenance of roads; however, no detrimental impacts to existing quarry operations are anticipated from the proposed project. Additional gravel sources outside of the CBGA may also be used. While there is potential to mine uranium in the CBGA, no development is expected in the near future, and the potential for other mineral development activities is low. Therefore, impacts from the proposed action on other mineral resources would be negligible.

4.1.3.3 Alternative 1

Since gas and oil recovery on the CBGA would continue until recovery becomes uneconomical, there would be no difference in impact levels to gas and oil between Alternative 1 and the proposed action. Impacts to coal and other mineral developments under Alternative 1 would be negligible and reduced by approximately 30% from those identified for the proposed action since 75 fewer well locations would be constructed; however, the potential for future conflicts between gas and oil recovery and coal mining would remain.

4.1.3.4 Alternative 2

There would be no difference in the level of impact under Alternative 2 compared with the proposed action and Alternative 1. While impacts to coal mining and the production of other mineral resources under Alternative 2 would be increased by approximately 20% (50 additional well locations), impacts would remain at negligible levels.

4.1.3.5 No Action

Impacts to existing gas and oil resources under the no action alternative would not be significant; however, rights to develop the gas on the CBGA as provided in existing leases would be infringed, which would be a significant adverse impact and violate contractual agreements between the government and the leaseholders. Under the no action alternative, oil and gas resources would remain available for future recovery; however, since the demand for energy is constantly growing, preclusion of development in the CBGA would necessitate development of alternative projects to meet increasing energy needs.

Under the no action alternative, there would be no impact to coal mining or other mineral resource developments.

4.1.3.6 Cumulative Impacts

Cumulative impacts on the recovery of gas and oil reserves from the proposed project and potential future developments within the CBGA combined with MDPA and GWAA developments would be significant. Many natural gas reservoirs would be depleted (e.g., the Mesaverde, Dakota, Muddy, Minnelusa, and Frontier Formations). Gas and oil are nonrenewable resources that, once utilized, are not available for future energy needs. However, because of the growing national demand for energy, nondevelopment of these resources would necessitate developing other energy sources to meet these demands.

All the proposed regional gas and oil development projects would result in fuel consumption during operations. While the amount of fuel consumption is unknown, the proportion of fuel consumed relative to the amount produced would be minor, and therefore, cumulative impacts from the proposed and potential future development of the CBGA, MDPA, and GWAA would be negligible.

Cumulative impacts to the development of coal resources resulting from gas and oil developments could result from the incremental increase in the length of time coal mining is excluded as new gas and oil development projects are initiated. Although coal mining is not anticipated in the near future, it may become economical prior to the cessation of gas and oil production operations in the region, at which point resource development conflicts could occur. When coal mining would become economical is not known, and thus, the magnitude of this potential impact cannot be evaluated. Since oil and gas developers in the area have leases in place, they have priority and would be allowed to continue to recover reserves under their current leases.

Cumulative beneficial impacts to the development of other mineral resources in southcentral Wyoming could occur as a result of improvements to local transportation networks and increased local demands (e.g., gravel). Road construction and the existence of ancillary facilities (e.g., power lines) may facilitate exploration for and recovery of other minerals. However, because the area is relatively remote, these resources would probably be of local importance only (BLM 1987:127). Therefore, potential beneficial impacts would be negligible.

4.1.4 Geologic Hazards

4.1.4.1 Significance Criteria

Impacts to the project from geologic hazards would be significant if project facilities are damaged due to seismic events, landslides, subsidence, or flooding. Impacts to geologic hazards would be considered significant if project activities resulted in reactivation of sand dunes, landslides, subsidence, or increased flooding.

4.1.4.2 Proposed Action

Potential impacts to the project from geologic hazards are negligible for the LOP and beyond. The depth of gas reserves negates the potential for subsidence, and there are no underground mines in the CBGA. Earthquake potential is very low, and thus, impacts from earthquakes are negligible. Wells and pipelines would be designed and constructed such that moderate earthquakes (intensity VI to VIII on the modified Mercalli scale) would not damage facilities.

Areas prone to landslides or flooding would be avoided, wherever possible; therefore, impacts from these hazards would be negligible. Removal of ground cover could result in reactivation of stabilized sand dunes which could cause significant soil loss and a decrease in productivity. Dunal areas would be avoided, where possible, and all necessary disturbances in dunal areas would be reclaimed and stabilized as soon as practical based on consultations with the BLM conducted during the APD and ROW application processes.

4.1.4.3 Alternative 1

Impacts on project activities from geologic hazards and impacts to geologic hazards under Alternative 1 would approximate those for the proposed action. Since development activities under Alternative 1 would be reduced by approximately 30% from the proposed action, there would be a similar reduction in potential impact levels.

4.1.4.4 Alternative 2

Impacts on project activities from geologic hazards and impacts to geologic hazards under Alternative 2 approximate those for the proposed action and Alternative 1. However, an additional 50 well locations would be developed under Alternative 2 thereby increasing the potential for impacts by approximately 20%.

4.1.4.5 No Action

Under the no action alternative, no impacts to or from geologic hazards would occur as a result of the proposed project, since no additional development would occur.

4.1.4.6 Cumulative Impacts

There is widespread potential for disturbance of sand dunes, landslide areas, and floodplains, within the CBGA, MDPA, and GWAA. There are approximately 16 mi^2 of dunal areas within the CBGA, 24 mi^2 within the MDPA, and "large areas of stabilized sand and silt dunes" in the GWAA (BLM 1992a). While the amount of existing disturbance in dunal areas is not known, future disturbance in these areas would be conducted to avoid disturbance of individual sand dunes, wherever possible. This would be possible since these areas are not completely occupied by dunes. However, if sand dunes do become reactivated impacts would be considered significant. Where dunes are disturbed, stringent erosion control methods would be used to maintain dune stability, and areas would be revegetated as soon as practical based on consultations with the BLM conducted during the APD and ROW application processes.

Landslides are present but not common in the combined CBGA, MDPA, and GWAA project areas. Known landslide areas would be avoided wherever possible, and areas suspected of having landslide potential would be evaluated by a qualified geological engineer or geologist prior to disturbance. Because landslide areas are uncommon and would primarily be avoided during development, impacts to these areas would likely be negligible.

The CBGA and the MDPA are classified as "D Zones" which are areas of undetermined but possible flood hazards. No flood data are available for the GWAA. There is potential for flooding along the perennial, intermittent, and ephemeral drainages within the three project areas. Each of the proposed developments would avoid floodplains wherever possible, and any necessary construction in floodplains would include erosion control, sedimentation control, and channel restoration and stabilization measures. Through avoidance and implementation of appropriate mitigations, impacts in floodplains would be negligible.

The potential for seismic activity is low throughout the region, and impacts from earthquakes would be negligible. There is no known potential for subsidence in the combined project areas; therefore, no subsidence impacts are anticipated.

4.1.5 Paleontological Resources

4.1.5.1 Significance Criteria

Impacts to paleontological resources would be considered significant if important fossils are lost or destroyed. Loss or destruction may occur directly during construction, or indirectly due to private collection or vandalism. Significant beneficial impacts would include discovery of important fossils during predisturbance paleontological surveys.

4.1.5.2 Proposed Action

Under the proposed action, areas that potentially contain important paleontological resources would be surveyed by BLM-authorized personnel prior to construction. The BLM has recently published guidelines describing the necessary qualifications for approved paleontologists and the criteria to be used to determine the level of impacts to paleontological resources (BLM 1993e). Significant paleontological resources would either be avoided or be recovered prior to construction in the area. Because the CBGA is known to be highly fossiliferous, monitoring during construction in certain areas may be required by the BLM. If important fossils are discovered during construction, surface disturbing activities at the site would cease until a qualified paleontologist can evaluate the site and appropriate mitigation measures are implemented.

Indirect impacts to paleontological resources could occur from the loss of important fossil materials due to private collection or vandalism of newly exposed areas. Beneficial impacts could result from the discovery and analysis by qualified personnel of paleontological resources uncovered during project implementation.

Because the potential for significant paleontological features at construction sites would be assessed during preconstruction site reconnaissance and then monitored, if necessary, during construction activities, both direct and indirect impacts to significant paleontological resources would be negligible. Paleontological resources discovered during project construction would be evaluated by a qualified paleontologist as deemed appropriate by the BLM and significant features avoided or recovered prior to continuing construction activities.

4.1.5.3 Alternative 1

Because the same mitigation measures would be used to prevent impacts to paleontological resources under Alternative 1 as under the proposed action, impacts to these resources would be negligible. In addition, the level of new ground disturbance under this alternative would also be reduced from approximately 1,248 acres for the proposed action to approximately 878 acres for Alternative 1 (Table 2.1).

4.1.5.4 Alternative 2

The same mitigation measures designed to prevent impacts to paleontological resources identified for the proposed action would be implemented under Alternative 2; therefore, paleontological impacts under this alternative would remain negligible even though an additional 248 acres of new disturbance would occur.

4.1.5.5 No Action Alternative

No negative impacts to paleontological resources would occur under the no action alternative. However, the potential for beneficial paleontological discoveries would be lost.

4.1.5.6 Cumulative Impacts

The combined disturbance of 7,494 acres on the CBGA, MDPA, and GWAA has the potential to uncover or destroy important fossils. However, all new development activities would be subject to stipulations promulgated in BLM guidelines for paleontologic surveys and evaluations and paleontologist qualifications (BLM 1993e). Adherence to these guidelines would prevent significant impacts to fossils throughout the combined project areas.

4.1.6 Soils

4.1.6.1 Significance Criteria

Impacts to soils would be considered significant if project activities resulted in noncompliance with stipulations presented in ERRPs. ERRPs are developed on a site-specific basis during the APD and ROW application processes and include provisions for:

- postdevelopment land use;
- erosion control during construction, operations, and reclamation;
- erosion control success standards; and
- revegetation success standards.

4.1.6.2 Proposed Action

Impacts to soils from the proposed action would be moderate during construction (1,248 acres of initial disturbance) and for the LOP (558 acres of new disturbance and 1,691 acres of existing disturbance) (Table 2.1). New disturbance would initially affect approximately 205 acres of alluvial fan soils, 454 acres of upland soils, 200 acres of ridge and escarpment soils, 249 acres of bottomland soils, and 140 acres of unknown soils. LOP disturbance (after initial reclamation and including some existing disturbance) would be 369 acres of soils on alluvial fans, 819 acres on uplands, 360 acres of soils on ridges and escarpments, 450 acres of soils in bottomlands, and 251 acres of unknown soils. Most disturbed areas would be reclaimed following project completion.

While sensitive soils would be avoided where possible during project construction, approximately 362 acres of alkaline soils, 65 acres of badland soils, and 74 acres of dunal soils could be disturbed. Alkaline, badland, and dunal soils are difficult to reclaim, and special attention would be given to potential soil disturbance and reclamation problems (e.g., erosion, revegetation) in ERRPs.

Soils in the CBGA are naturally highly erodible, and the amount of soil lost under natural conditions has not been quantified. However, the widespread potential for severe wind and water erosion on CBGA soils indicates that soil losses would increase as a result of the proposed action. The amount of this additional soil loss depends upon site-specific conditions and the effectiveness of proposed mitigation measures.

Moderate construction phase and LOP soil impacts would occur during vegetation stripping, topsoil salvage and stockpiling, cut and fill operations, and increased soil exposure. Exposed or stockpiled soils would be subject to accelerated erosion due to higher runoff rates, lower infiltration rates, and greater exposure to wind, unless erosion control measures are implemented. Soil compaction, caused by equipment traffic or raindrop impact, may result in reduced soil productivity due to loss of soil structure, increased erodibility, and decreased infiltration and water storage capacity. Crusts formed on exposed soils also could inhibit infiltration and productivity.

Soils could be contaminated by accidental spills of petroleum products or other hazardous materials (see Section 4.7).

Some soils in the CBGA may contain relatively high levels of selenium, and disturbance of these soils may result in increased selenium mobilization through plant uptake and erosion. However, with the relatively small amounts of new disturbance (1,248 acres initially and 558 acres for the LOP), increases in selenium mobilization resulting from the proposed action are expected to be negligible.

Compliance with standard surface protection stipulations that restrict disturbance of slopes greater than 25% and when the soil is frozen or during periods when soil material is saturated would also limit potential impacts (see Appendix A). At locations where these areas and soils must be impacted and hence the potential for soil loss is increased, rigorous erosion control measures would be applied (e.g., use of stabilizers such as tackifiers or netting) to minimize soil loss. Erosion control efforts would be monitored and repeated, if necessary, until erosion is minimized. Soils compacted during construction would be sufficiently ripped and tilled prior to topsoil spreading and reseeding. In addition, project activities would comply with measures identified in the Stormwater Pollution Prevention Plan.

4.1.6.3 Alternative 1

Impacts to soils under Alternative 1 would be moderate during construction and for the LOP; however, the total area of soils impacted would be reduced to 878 acres initially and 1,579 acres for the LOP (393 acres of new disturbance and 1,186 acres of existing disturbance) (Table 2.1). If the distribution of well locations would affect a similar proportion of soils as in the proposed action, Alternative 1 would affect approximately 143 acres of soils on alluvial fans (258 acres for the LOP), 318 acres of soils on uplands (573 acres for the LOP), 140 acres of soils on ridges and escarpments (252 acres for the LOP), 175 acres of soils on bottomlands (315 acres for the LOP), and 102 acres of unknown soils (181 acres for the LOP).

4.1.6.4 Alternative 2

Impacts to soils under Alternative 2 would be moderate during construction and for the LOP; however, the total area of soils impacted would be increased to 1,496 acres initially and 2,028 acres for the LOP (667 acres of new disturbance and 2,028 acres of existing disturbance) (Table 2.1). If the distribution of well locations would affect a similar proportion of soils as in the proposed action and Alternative 1, initial disturbance under Alternative 2 would affect approximately 243 acres of soils on alluvial fans, 541 acres of soils on uplands, 238 acres of soils on ridges and escarpments, 297 acres of soils on bottomlands, and 173 acres of unknown soils. LOP disturbances would be approximately 439 acres on alluvial fan soils, 974 acres on upland soils, 428 acres on ridge and escarpment soils, 535 acres on bottomland soils, and 319 acres on unknown soils.

4.1.6.5 No Action Alternative

Under the no action alternative, there would be no new impacts to soils, and the existing 4,304 acres of soil disturbance would remain.

4.1.6.6 Cumulative Impacts

Total soil disturbance resulting from existing, proposed, and potential future activities in the CBGA would be approximately 6,972 acres or 3.4% of the area (Table 4.1). When combined with disturbances in the MDPA and GWAA, soil disturbance totals would be approximately 7,494 acres or 1.4% of the combined project areas. Cumulative impacts during project construction phases could become significant regionally due to the combined levels of soil disturbance plus additional disturbance from potential future developments; however, LOP impacts are expected to be moderate since it is assumed adequate mitigation measures as stipulated in ERRPs would be successfully implemented. The potential for affecting sensitive soils is present throughout the three project areas, and therefore, there is the potential for widespread soil loss unless avoidance and mitigation measures are employed. Most disturbed areas affected by the projects would be reclaimed upon project completion.

4.1.7 Surface Water and Groundwater

4.1.7.1 Significance Criteria

Impacts to surface water and groundwater resulting from the proposed project would be considered significant if:

- surface water quality declined such that existing WDEQ surface water quality classifications (WDEQ 1990) were no longer applicable (e.g., surface water quality in Muddy Creek declined from Class 3 to Class 4);

- surface water quality in areas south of the Continental Divide violated the Colorado Basin Salinity Control Act of 1974;
- surface water quantities were depleted such that water rights of downstream users were violated;
- groundwater quality in local stock or domestic wells declined such that the waters would no longer be suitable for current uses;
- groundwater quantities were depleted such that local wells would no longer serve their present functions; or
- project activities were conducted in violation of procedures specified in the Stormwater Pollution Prevention Plan.

4.1.7.2 Proposed Action

Impacts to surface water quality and quantity from the proposed action would be negligible for the LOP and beyond. Potential impacts include increased turbidity, salinity, and sedimentation of surface waters due to runoff and erosion from disturbed areas. Accidental spills of petroleum products or other pollutants also could impact surface water quality (see Section 4.7). Only minimal amounts of surface water may be used for the proposed project, and thus, no significant impacts resulting from surface water depletions are anticipated.

Erosion control measures, including diversion terraces, riprap, matting, temporary sediment traps, water bars, and timely revegetation of disturbed areas would minimize runoff-related sedimentation impacts. Erosion-prone areas (e.g., steep slopes, floodplains, sand dunes, and badlands) would be avoided wherever possible. If it is necessary to disturb these areas, construction would occur during the late summer, fall, and winter to avoid high-flow periods. Project activities would be conducted as specified in the Stormwater Pollution Prevention Plan.

Proper containment of oil and fuel in storage areas, containment of fluids in reserve pits, and locating wells away from drainages would minimize potential surface water contamination. Contaminated soil from accidental spills would be cleaned up immediately as required by regulation.

Impacts to groundwater from the proposed action would include the consumption of water used during drilling and completion. An estimated 630,000 gallons per well would be needed for drilling, and an additional 84,000 gallons per well would be required during completion and testing. A total of 196,350,000 gallons (602.5 acre-feet) would be required for implementation of the proposed action. Water would be provided primarily from four existing wells completed at depths of 8,990; 9,855; 1,100; and 1,630 ft. Local stock and domestic wells on the CBGA are typically 100 to 450 ft deep and thus would not be affected by water withdrawals from deeper formations. One flowing artesian stock well on the CBGA taps waters from 2,600 ft below the ground surface; however, because the well is completed at an intermediate depth and occurs greater than 4 mi from the existing drilling and completion water supply wells, it is unlikely that it would be affected. If additional water is required for drilling, it would primarily be obtained from the Baggs water supply where excess capacity exists.

Water and muds used for drilling would be stored in reserve pits at each well location. While the majority of pits would be lined, some pits in areas with tight soils would be unlined, and thus, there is the potential for contamination of surficial aquifers from drilling fluids. Aquifer contamination from surface infiltration from reserve pits would be controlled by lining pits in areas where soils are incapable of containing fluids, on sites within 500 ft of surface water or 100 ft of ephemeral or intermittent channels, or where groundwater is encountered during pit construction. Determinations regarding pit lining would be made by the BLM on a case-by-case basis during the APD process.

An average of 4 bpd of water would be produced from each completed gas well. This water would be stored in tanks at each well location or piped to tanks located at a centralized facility. The majority of produced water would be transported from storage tanks to existing, lined evaporation pits at the Mexican Flats water disposal facility. This facility is currently operating at less than 50% of capacity, and total capacity at the facility can be increased by an addition 30%. In the event that produced water quality at a specific well is determined to be of suitable quality, NPDES permits could be obtained, and the water would be discharged on the ground surface in an appropriate manner after consultation with the WDEQ, BLM, WGFD, and potentially affected livestock operators.

Potential impacts to deeper aquifers include cross-aquifer mixing through the well bore. All wells would be cased and cemented to depths below accessible freshwater zones, and all wells would be constructed according to WOGCC, BLM, and WDEQ regulations to prevent cross-aquifer contamination. Uneconomical gas wells and water wells that would no longer be used would be properly abandoned and plugged using procedures identified in *Rules and Regulations of Wyoming Oil and Gas Conservation Commission* (WOGCC 1991) and the BLM.

With the implementation of the aforementioned mitigation measures, surface and groundwater impacts resulting from the proposed action would be negligible, and no long-term impacts to surface or groundwater would occur.

4.1.7.3 Alternative 1

Because the same mitigation measures would be employed under Alternative 1 as under the proposed action, impacts to surface and groundwater would be negligible for the LOP and beyond. Only 200 wells would be drilled under this alternative, and water consumption volumes would be reduced to 142,800,000 gallons (438.2 acre-feet). In addition, the total area of new surface disturbance resulting from Alternative 1 would be reduced from the 1,248 acres required for the proposed action to 878 acres (Table 2.1), thereby reducing potential increases in runoff sediment loads.

4.1.7.4 Alternative 2

Although increased surface disturbance and increased water consumption would occur under Alternative 2, impacts to surface and groundwater resources would remain at negligible levels since the same mitigation measures would be employed under this alternative as under the proposed action. A total of 330 wells would be drilled under this alternative, and approximately 235,620,000 gallons (723.0 acre-feet) of water would be required over the LOP. Additionally, approximately 1,496 acres of new surface disturbance would be required.

4.1.7.5 No Action Alternative

Under the no action alternative, there would be no impacts to surface or groundwater from the proposed project.

4.1.7.6 Cumulative Impacts

Since no surface water is proposed for use during the development of the CBGA, MDPA, and GWAA, there would be no cumulative impacts to surface water quantities. Surface water quality would be protected using measures similar to those described for the proposed action, and thus, cumulative impacts to surface water quality would be negligible.

The MDPA development is expected to use approximately 254 acre-feet of groundwater during drilling and construction, and the GWAA development is expected to utilize 264 acre-feet. The CBGA development would use a maximum of 723 acre-feet (under Alternative 2) for a total of 1,241 acre-feet of water consumed. If 900 additional wells are drilled and completed on the CBGA, an additional 1,972 acre-feet would be consumed. Total cumulative water consumption would therefore be 3,213 acre-feet. While total groundwater reserves for the region have not been determined, existing data suggest that sufficient quantities of groundwater are available (see Section 3.1.5.2). The cumulative volume of groundwater anticipated for consumption is relatively small compared with existing regional water supplies; for example, total cumulative water consumption for the combined three project areas amounts to approximately 0.2% of the total capacity of Seminoe Reservoir. Cumulative impacts to groundwater quantity are expected to be negligible.

All the proposed regional oil and gas development projects would use mitigation measures similar to those described for the proposed action to prevent groundwater pollution. Therefore, impacts to groundwater quality are expected to be negligible.

4.1.8 Noise and Odor

4.1.8.1 Significance Criteria

Significant noise impacts would occur if long-term project activities result in exceeding the federal 55 dBA maximum standard for noise at residences and/or other noise-sensitive locations (i.e., sage grouse leks during the breeding season, raptor nests during breeding and nesting seasons, and big game crucial winter range during critical winter periods). Odors produced as a result of the proposed project would be significant if they caused current CBGA land users to utilize locations outside the CBGA to avoid exposure to these odors.

4.1.8.2 Proposed Action

Perceived sound levels from oil and gas operations are determined by the loudness and pitch of the sound at the source, the listener's distance from the source, air temperature, humidity, turbulence, wind gradient, and screening effects from terrain or vegetation (Engineering Dynamics 1984). The proposed action would generate noise through well location, road, and pipeline construction, drilling and ancillary facility operations, vehicle traffic, site rehabilitations, and potential seismic operations. Drill rig operations have noise levels of up to 115 dBA with a noise level of 55 dBA at 3,500 ft from the source (BLM 1991b). With standard mitigation measures applied, rig noise would be reduced to below 55 dBA at 500 ft from the source. Drilling operations would not be conducted within 500 ft of occupied residences or other known noise-sensitive locations (e.g., sage grouse leks, raptor nests) during crucial periods.

Mitigations for drilling rig noise would include noise mufflers on drilling rigs. To mitigate impacts associated with increased noise levels throughout the CBGA, all engines (e.g., rigs, construction equipment, vehicles) required for project activities would be properly muffled and maintained, and construction, drilling, and completion activities would be limited during critical winter periods and proximal (within 0.75 mi or other distance as deemed appropriate by the BLM) to active raptor nests during crucial nesting periods. Additionally, no surface disturbance would occur on public lands within 0.25 mi of sage grouse leks, and activities on public lands within 2.0 mi of leks would be restricted during the nesting period as deemed appropriate by the BLM.

Increased noise levels associated with drilling rigs, completion activities, and other construction equipment employed during peak activity periods would constitute short-term, moderate level impacts during construction, drilling, completion, and testing. Increased traffic throughout the LOP would constitute a long-term, negligible noise impact.

Odors present periodically at well and ancillary facility locations and along roadways could offend area users in the vicinity of emission sources. Odors associated with drilling and production operations on the CBGA are neither hazardous nor noxious, and impacts from odors would likely be negligible for the LOP due to wind dispersal. Natural gas from the target formations does not contain H_2S, and therefore, no H_2S odor or health hazards would be present. No mitigations for odor are planned for the proposed action.

4.1.8.3 Alternative 1

Impacts resulting from noise and odor under the implementation of Alternative 1 would be similar to those identified for the proposed action. Noise and odor impact occurrences would be reduced by approximately 30% since 75 fewer wells would be developed. Noise impact mitigations as identified for the proposed action would be implemented under Alternative 1.

4.1.8.4 Alternative 2

While an additional 55 wells would be drilled and completed under Alternative 2, impacts associated with noise and odor from this alternative would remain at the same level as those identified for the proposed action. Noise impact mitigations as identified for the proposed action would be implemented under Alternative 2.

4.1.8.5 No Action

No additional impacts from noise and odor above existing levels on the CBGA would occur under the no action alternative, since no additional oil and gas developments would occur.

4.1.8.6 Cumulative Impacts

The incremental increase in cumulative impacts resulting from past, present, and potential future project noises and odors would likely occur at moderate levels for the CBGA and surrounding areas. Impacts would be of the same type as those described for the proposed action and would primarily occur at or near development locations; however, noise and odor impacts may augment the level of impacts to other resources present in the area (e.g., increased acreage of wildlife habitat loss, increased impacts to recreational users).

4.2 BIOLOGICAL RESOURCES

4.2.1 Vegetation

4.2.1.1 Significance Criteria

Impacts to vegetation resulting from the proposed project would be considered significant if:

- an overall change in land use occurs;
- vegetation productivity is not restored to at least predisturbance levels;
- species composition and diversity change by greater than 50%, five years after revegetation;
- excessive weed infestation occurs; and/or
- ERRP stipulations are not met.

4.2.1.2 Proposed Action

Removal of vegetation, temporary changes in vegetation types (e.g., shrubland to grassland conversions), weed infestations, and the potential for accelerated erosion constitute both short-term and LOP impacts. Mitigation measures to limit vegetation impacts include minimizing the size of disturbance, using appropriate erosion and sedimentation controls, weed control practices as deemed appropriate by the BLM, and implementing prompt revegetation using an appropriate locally adapted seed mixture. With the application of mitigation measures, impacts to vegetation resulting from the proposed action are anticipated to be negligible for the LOP.

Of the 1,248 acres of initial disturbance (Table 2.1), approximately 506 acres of the saltbush vegetation type, 367 acres of sagebrush, 99 acres of greasewood, 20 acres of juniper, 10 acres of mountain shrub, five acres of grassland, five acres of riparian meadow, five acres of barren or near-barren areas, and

231 acres of unknown vegetation would be disturbed. The LOP disturbance of 2,249 acres (558 acres of new LOP disturbance and 1,691 acres of existing disturbance required for the proposed action) would include 965 acres of saltbush, 700 acres of sagebrush, 189 acres of greasewood, 38 acres of juniper, 19 acres of mountain shrub, 10 acres of grassland, 10 acres of riparian meadow, 10 acres of barren areas, and 308 acres of unknown vegetation.

Areas scheduled for reclamation would be seeded with a BLM-approved mixture of plant species in the fall prior to ground freeze-up, or in the spring prior to April 15 if fall seeding is not feasible. Reclamation procedures would comply with the BLM's *Wyoming Policy on Reclamation* (BLM 1990b). Potential plant species for use in reclamation are discussed in Section 5.1.2.4. Appropriate erosion control techniques (e.g., water bars, mulch, etc.) would be employed in erosion-prone areas as needed.

Revegetation may, during some years at some locations, be inhibited by arid conditions and/or soil limitations. CBGA operators, under BLM supervision, would be responsible for monitoring reclamation success. In addition, site-specific conditions at each proposed development site would be evaluated, and appropriate measures such as ripping, pitting, windrowing, mulching, and/or reseeding with BLM-approved alternative non-native species would be employed. Increases in abundance of weedy species would be mitigated promptly using appropriate control methods. The primary procedure for preventing weed infestation would be prompt revegetation of disturbed areas with locally adapted desirable plant species. If weed control is necessary, mechanical means (e.g., harrowing, disking) may be used. If chemical control is necessary, prior approval would be obtained from the BLM, and only chemicals approved for the specific application would be used.

4.2.1.3 Alternative 1

Under Alternative 1, approximately 30% less vegetation would be disturbed than under the proposed action (878 acres initially and 1,579 acres for the LOP) (Table 2.1). Because mitigation and reclamation measures would be implemented as described for the proposed action, impacts to vegetation would be negligible for the LOP.

4.2.1.4 Alternative 2

Under Alternative 2, approximately 20% more vegetation would be disturbed than under the proposed action (1,496 acres initially and 2,695 for the LOP) (Table 2.1). However, because mitigation and reclamation measures would be implemented as described in the proposed action, impacts to vegetation would remain at negligible levels for the LOP.

4.2.1.5 No Action

Under the no action alternative, there would be no increase in vegetation impacts from the proposed project since no additional disturbance would occur.

4.2.1.6 Cumulative Impacts

Existing, proposed, and potential future disturbance from oil and gas developments in the CBGA, MDPA, and GWAA would total 7,494 acres (Table 4.1). This represents a physical shift in land use from livestock grazing and wildlife habitat to industrial use on 1.4% of the combined project areas. The primary measures for reducing cumulative impacts would be successful revegetation with adapted, native and introduced plant species. It is assumed that successful revegetation would be accomplished, and therefore, postdevelopment land use, productivity, plant species diversity, ground cover, wildlife habitat, and weed control goals would be achieved, and cumulative impacts would be negligible. Vegetation success criteria would be included in ERRPs for each well drilled.

4.2.2 Wetlands and Riparian Areas

4.2.2.1 Significance Criteria

Impacts to wetlands and riparian areas would be considered significant if project activities resulted in violation of Section 404 of the Clean Water Act or Executive Order 11990. Section 404 governs the placement of dredged or fill material in waters of the U.S., and Executive Order 11990 mandates no net loss of wetlands.

4.2.2.2 Proposed Action

Where possible, no surface disturbance would occur within 500 ft of wetlands or open water, or within 100 ft of ephemeral or intermittent channels; and since there would be no net loss of wetlands, impacts to wetlands would be negligible.

Pipelines and roadways would follow existing ROWs as much as possible, and established crossings, culverts, or temporary bridges would be utilized. Streams would be crossed during periods of low or no flow, and crossings would be made perpendicular to the stream channel, where possible. Temporary channel stabilization techniques (e.g., riprap) and diversions would be used, if necessary, to minimize erosion and sedimentation during construction in channels.

If wetland or riparian areas are unavoidable, appropriate mitigation measures would be developed in coordination with the COE and BLM biologists. When rehabilitation of a wetland area is required, the initial primary objective would be soil stabilization with native species. The desired plant species composition after rehabilitation would depend on site-specific objectives.

4.2.2.3 Alternative 1

Since there would be no net loss of wetlands and project activities would comply with Section 404 of the Clean Water Act, impacts to wetlands and riparian areas under Alternative 1 would be negligible.

4.2.2.4 Alternative 2

As with the proposed action and Alternative 1, there would be no net loss of wetlands under Alternative 2, and project activities under the alternative would comply with Section 404 of the Clean Water Act; therefore, impacts to wetlands and riparian areas would be negligible.

4.2.2.5 No Action

There would be no impacts to wetlands or riparian areas from the proposed project under the no action alternative, since no further development of the CBGA would occur.

4.2.2.6 Cumulative Impacts

Cumulative impacts to wetlands and riparian areas would be negligible because future development activities would comply with Section 404 of the Clean Water Act and Executive Order 11990. Avoidance and mitigation measures described for the proposed action would be applied during development of the MDPA and GWAA.

4.2.3 Wildlife and Fisheries

Impacts to wildlife resources from construction, drilling, and completion activities would generally be through loss of habitat and disruption of activities due to human presence. Impacts to wildlife would continue during the LOP as a result of disturbance due to increased human activities. Given adherence to wildlife protection measures identified in this EIS, impacts to wildlife would range from negligible to moderate during the initial construction phase, for the LOP, and until areas are adequately revegetated.

4.2.3.1 Big Game/Other Mammals

Significance Criteria. Impacts to big game and other mammals would be considered significant if project-related activities resulted in:

- a loss of greater than 1% of the existing crucial big game habitat for a herd unit (Environmental Research and Technology, Inc. 1983a, 1983b);
- nonattainment of WGFD big game population objectives;
- a 5% or greater increase in annual direct mortality (e.g., road kills, poaching) of any mammal species in the CBGA; or
- a loss of greater than 2% of existing species-specific nongame and small mammal habitats within the CBGA.

Proposed Action. Thirty-seven of the 250 proposed well locations (15%) would be drilled within crucial winter/yearlong range for the Bitter Creek pronghorn herd, and total initial surface disturbance would cover 185 acres (Table 4.2). This range reduction represents a loss of approximately 0.9% of the crucial winter/yearlong range for the Bitter Creek herd within the CBGA. Remaining disturbance within the boundaries of this herd (157 well locations and associated disturbance) would remove 784 acres of winter/yearlong range, or approximately 0.8% of this range type for the Bitter Creek herd within the CBGA. Although reclamation of 1.0 acre of initial disturbance at well locations, 19 ft of all road ROWs, and entire pipeline ROWs outside of road ROWs would reduce the amount of new disturbance in these ranges, LOP disturbance would be increased due to the inclusion of existing disturbances. LOP disturbance for the Bitter Creek herd would be 333 acres of crucial winter/yearlong range (i.e., 1.7% of this range type within the CBGA) and 1,412 acres of winter/yearlong range (i.e., 1.5% of this range within the CBGA); however, impacts to the Bitter Creek pronghorn herd would be insignificant and likely occur at moderate levels (see Cumulative Impacts Section below).

For the Baggs pronghorn herd, 35 of the 250 proposed well locations (14%) would be located within crucial winter/yearlong range; along with associated roads, pipelines, and ancillary facilities, this would result in the initial removal of 175 acres of crucial range for this herd (Table 4.2). This habitat reduction represents a loss of approximately 0.8% of the crucial winter/yearlong range for the Baggs pronghorn herd within CBGA. The 21 remaining well locations within the Baggs herd are located within winter/yearlong range and represent a loss of 105 acres (0.4%) of this range type for the herd within the CBGA. LOP disturbances for the herd would be 315 acres (0.8%) and 189 acres (0.4%) for crucial winter/yearlong and winter/yearlong ranges within the CBGA, respectively; therefore, impacts would not be considered significant.

Thirty-three of the proposed well locations would be located within crucial range for the Baggs mule deer herd; 120 acres (24 wells) would be initially disturbed within crucial winter range, and 45 acres (9 wells) would be disturbed within crucial winter/yearlong range (Table 4.2). This habitat reduction represents an initial loss of approximately 0.7% and 0.3% of crucial mule deer range within the CBGA; LOP loss would be 1.4% (297 acres). The remaining 217 well locations would be placed within winter/yearlong range and would result in a 0.6% (1,083 acres) initial loss of this range type within the CBGA. Impacts to the herd would be considered insignificant and would likely occur at moderate levels (see Cumulative Impacts Section below).

Thirty-one wells would be located in winter range for the Sierra Madre elk herd and would result in an initial disturbance of 155 acres (0.3%) of this range within the CBGA (Table 4.2). The LOP disturbance would be 279 acres of elk winter range, or 0.6% of this range type within the CBGA, and impacts to the Sierra Madre elk herd are considered negligible. No elk crucial ranges occur within the CBGA.

Table 4.2 Potential Initial and LOP Disturbances Within Wildlife Habitats for Proposed Action and Alternatives, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Wildlife Resource	Acreage of Wildlife Habitat Within the Project Area	Proposed Action[1]				Alternative 1[2]				Alternative 2[3]			
		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed	
		New[4]	LOP[5]	New[6]	LOP[7]	New[4]	LOP[5]	New[6]	LOP[7]	New[4]	LOP[5]	New[6]	LOP[7]
Pronghorn antelope													
Bitter Creek herd													
Crucial winter/ yearlong range	19,866	184.7	332.9	0.9	1.7	129.9	233.7	0.7	1.2	221.4	398.9	1.1	2.0
Winter/ yearlong range	96,047	783.8	1,412.3	0.8	1.5	551.5	991.6	0.6	1.0	939.6	1,692.4	1.0	1.8
Baggs herd													
Crucial winter/ yearlong range	39,008	174.7	314.9	0.4	0.8	122.9	221.1	0.3	0.6	209.4	377.3	0.5	1.0
Spring-summer-fall range	633	0	0	0	0	0	0	0	0	0	0	0	0
Winter/ yearlong range	52,192	104.8	188.9	0.2	0.4	73.7	132.6	0.1	0.3	125.6	226.4	0.2	0.4
Mule deer													
Baggs herd													
Crucial winter ranges[8]	21,135	164.7	296.9	0.7	1.4	115.9	208.5	0.5	1.0	197.4	355.8	0.9	1.7
Winter/ yearlong range	186,611	1,083.3	1,952.1	0.6	1.0	762.1	1,370.5	0.4	0.7	1,298.6	2,339.2	0.7	1.3
Elk													
Sierra Madre herd													
Winter range	45,773	154.8	278.9	0.3	0.6	108.9	195.8	0.2	0.4	185.6	334.2	0.4	0.7

Table 4.2 (Continued)

Wildlife Resource	Acreage of Wildlife Habitat Within the Project Area	Proposed Action[1]				Alternative 1[2]				Alternative 2[3]			
		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed		Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitat Disturbed	
		New[4]	LOP[5]	New[4]	LOP[7]	New[4]	LOP[5]	New[6]	LOP[7]	New[4]	LOP[5]	New[6]	LOP[7]
Raptors													
Potential habitat[9]	207,746	1,248.0	2,249.0	0.6	1.1	878.0	1,579.0	0.4	0.8	1,496.0	2,695.0	0.7	1.3
Nesting buffer[10]	91,159	594.0	1,070.5	0.7	1.2	417.9	751.6	0.5	0.8	712.0	1,282.8	0.8	1.4
Sage grouse													
Probable nesting habitat[11]	146,385	634.0	1,142.5	0.4	0.8	446.0	802.1	0.3	0.5	760.0	1,369.1	0.5	0.9
Potential breeding habitat[12]	5,018	0	0	0	0	0	0	0	0	0	0	0	0

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[1] Assumes disturbance from 250 new well locations, a maximum of 40 mi of new road (55 ft ROW/disturbance width), 115 mi of new pipelines (50 ft ROW, 25 ft disturbance width outside road ROW), a new 8.0 acre compression facility, and 1,691 acres of existing road, pipeline, and ancillary facility disturbance.

[2] Assumes disturbance from 175 new well locations, 28 mi of new road, 81 mi of new pipelines, a new 8.0 acre compression facility, and 1,186 acres of existing road, pipeline, and ancillary facility disturbance; overall, approximately 30% less disturbance than the proposed action.

[3] Assumes disturbance from 300 new well locations, 48 mi of new road, 138 mi of new pipelines, a new 8.0 acre compression facility, and 2,028 acres of existing road, pipeline, and ancillary facility disturbance; overall, approximately 20% more disturbance than the proposed action.

[4] Assumes 4.99 acres of new disturbance for each well from well locations, roads, pipelines, and ancillary facilities.

[5] Assumes 8.99 acres of LOP disturbance for each well from well locations, roads, pipelines, and ancillary facilities.

[6] Percent new disturbance = (total new disturbance/total acreage of resource) x 100.

[7] Percent LOP disturbance = (total LOP disturbance/total acreage of resource) x 100.

[8] Includes both crucial winter and crucial winter/yearlong range.

[9] Assumes the entire CBGA is suitable raptor habitat.

[10] Includes areas within 0.75 mi of all known raptor nests on the CBGA.

[11] Includes areas within 2.0 mi of known lek sites on the CBGA.

[12] No disturbance within 0.25 mi of known lek sites on the CBGA would occur.

While individual well locations would be fenced if necessary, no extensive fencing of ROWs would be used. Therefore, big game migration through the CBGA would not be directly affected.

Reclamation of the well location and ROW areas, which would begin on nonessential areas as soon as possible following well testing and pipeline installation, would provide grasses for forage within a few years. Sagebrush and other winter forage would take longer to become established, with estimates ranging from three to 20 years (Plummer et al. 1968; Environmental Studies Board 1974; Fisser 1981; Wasser and Shoemaker 1982). Severson et al. (1968) reported that browse constituted as much as 98% of the winter forage of pronghorn in the Red Desert of Wyoming. Sagebrush was the major item eaten by pronghorn during winter and spring in the same area (Severson and May 1967). Mule deer and elk may also rely heavily on sagebrush and other shrubs during the winter months. The area to be disturbed for road and pipeline ROWs would be kept to a minimum, thereby reducing the acreage removed from vegetative production during the LOP.

In addition to the direct loss of habitat due to construction, short-term disturbances from drilling activities and traffic would impede utilization of habitat immediately adjacent to these areas and may cause animal stress. Pronghorn response to mining and drilling activities has been observed to range from relative habituation (Reeve 1984) to avoidance of areas of equipment activity (Segerstrom 1982; Easterly et al. n.d.). Mule deer responses to human activity have also been observed to vary, ranging from habituation to traffic (Ward et al. 1980) and drilling activities (Easterly et al. n.d.) to displacement due to the same disturbance types (Hiatt and Baker 1981). In general, elk avoid areas of extensive human activity and disturbance (Hiatt and Baker 1981; Johnson and Wollrab 1987). Displacement of big game would likely occur at its highest levels during the construction and drilling phases when human activities occur at their highest levels. During the production phase of the project, with the relative absence of humans, pronghorn and mule deer would likely become accustomed to equipment and facilities and would use habitats immediately adjacent to wells; elk would likely use areas more remote from operating equipment.

Within crucial ranges, construction, drilling, and production facility installation activities would be scheduled during the period from May 1 through November 14 on public lands to prevent disturbance of wintering animals. Exceptions which allow these activities on public land crucial winter ranges may be granted by the Authorized Officer if mild winter conditions prevail and ample foraging habitat remains for pronghorn and mule deer on adjacent areas.

Mortality is a potential direct impact that may occur due to road kill associated with increased traffic in the CBGA for the LOP. Construction of roads utilizing safe design criteria and employee education regarding safe operating procedures would prevent major losses to mammal populations, thereby reducing the effect of vehicle collisions to negligible levels for the LOP.

Increased access to big game range may increase legal and illegal harvest, by providing additional opportunities for humans to come into contact with animals. Some individuals may be deterred from poaching because of the greater access and likelihood of being observed by other area users. Law enforcement activities may need to be increased within the CBGA to deter illegal harvesting of big game. SOCO and other CBGA operators have committed to educating employees regarding WGFD rules and regulations for the area, and project personnel would support WGFD surveillance in the area by immediately reporting all observed illegal harvesting of wildlife or other mortality of important wildlife on the CBGA. In addition, any project employee caught violating wildlife laws would be disciplined and may be dismissed. The proposed action is expected to have negligible impacts during the LOP on the ability of the WGFD to achieve population objectives for big game populations on the CBGA.

While nongame and small mammals would be negatively affected by increased human activity on the CBGA, primary effects would occur in direct proportion to the amount of a species' habitat removed. Since total initial surface disturbance represents only 0.6% of the CBGA and rare habitats (e.g., wetlands) would be avoided where possible, impacts on these populations are expected to be moderate for most species. This would increase slightly to 1.1% of the CBGA for the LOP. A slight increase in mortality from increased traffic in the CBGA is expected, but these impacts would be negligible.

If nongame and small mammals are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances, appropriate measures to restrict access (e.g., fencing, netting, pool covers) would be employed to assure that impacts to wildlife are minimized and remain negligible for the LOP. These measures would be monitored for effectiveness by the BLM, and if proven ineffective, further mitigation measures would be applied. All reserve pits would be fenced and netted as deemed appropriate by the BLM.

Alternative 1. Under Alternative 1, the amount of disturbance within big game ranges on the CBGA would be reduced by approximately 30% from that of the proposed action (Table 4.2). As with the proposed action, it is anticipated that impacts to big game populations on the CBGA due to this alternative would be moderate to negligible during construction and negligible for the LOP.

Approximately 130 acres of pronghorn crucial winter/yearlong range within the Bitter Creek herd would initially be impacted under this alternative (Table 4.2). This represents a loss of approximately 0.7% of the crucial winter/yearlong range for this herd within the CBGA. Approximately 0.3% (123 acres) of the crucial winter/yearlong range for the Baggs pronghorn herd within the CBGA would be initially lost due to project activities associated with this alternative. One hundred-sixteen acres of crucial range (i.e., crucial winter and crucial winter/yearlong range combined) for the Baggs mule deer herd would be initially disturbed. This would represent a loss of approximately 0.5% of this range type for the herd within the CBGA. LOP disturbance within mule deer crucial range would be 209 acres, or 1.0% of this range within the CBGA.

Nongame and small mammal habitat removal would decrease under this alternative to 0.4% of the CBGA (0.8% for the LOP); impacts to these mammals would likely be negligible under this alternative.

Alternative 2. The level of disturbance within big game ranges on the CBGA would be increased by about 20% over that associated with the proposed action under Alternative 2 (Table 4.2). Approximately 221 acres (1.1%) of the Bitter Creek pronghorn crucial winter/yearlong range within the CBGA would initially be disturbed under this alternative, and approximately 209 acres (0.5%) of crucial winter/yearlong range for the Baggs herd would initially be disturbed. Initial disturbance within crucial range for the Baggs mule deer herd would increase to 197 acres, or 0.9% of this range on the CBGA; LOP disturbance would total 356 acres, or 1.7% of this range on the CBGA. Although overall impacts to big game populations on the CBGA would increase under this alternative, with the application of mitigation measures as defined for the proposed action, it is anticipated that they would remain moderate to negligible during construction and negligible for the LOP.

Nongame and small mammal habitat removal would increase under this alternative to 0.7% of the CBGA (1.3% for the LOP). Impacts to these mammals would likely be moderate under this alternative.

No Action. No impacts beyond those currently existing on the CBGA would occur to mammal populations under the no action alternative, since no additional disturbance would occur.

Cumulative Impacts. Less than 0.1% of the crucial winter/yearlong range for the Bitter Creek pronghorn herd would be directly impacted by surface disturbance from the proposed project (Table 4.3). LOP disturbance, which includes existing disturbance on the CBGA, would be approximately 0.2% of the crucial winter/yearlong range for the Bitter Creek herd. Inclusion of disturbance associated with developments in the MDPA (BLM 1992c) would bring the total disturbance within crucial range for the Bitter Creek pronghorn herd to approximately 0.3%. The proposed development in the CBGA would not significantly increase the cumulative impacts to crucial range for the Bitter Creek pronghorn herd. Overall, cumulative impacts to this herd are anticipated to be moderate to negligible. For the Baggs pronghorn herd, approximately 0.2% of crucial winter/yearlong range would be directly impacted by the proposed project; LOP disturbance would be approximately 0.3% of this herd's crucial range (Table 4.3). No other development projects in the region are known to impact crucial range for this herd. The proposed development in the CBGA would not significantly increase the cumulative impacts to crucial range for the Baggs pronghorn herd; cumulative impacts would remain moderate to negligible.

As with the Baggs pronghorn herd, crucial range (i.e., crucial winter and crucial winter/yearlong range) for the Baggs mule deer herd would be impacted solely by the proposed project. Less than 0.1% of crucial range would be directly impacted by the proposed action, although this would increase to approximately 0.1% of the crucial range for the LOP (Table 4.3). The proposed development in the CBGA would not significantly increase the cumulative impacts to crucial range for the Baggs mule deer herd; cumulative impacts would remain moderate to negligible.

The potential future addition of 900 wells within the CBGA could result in increased disturbance within big game crucial ranges; this future action could result in significant impacts to these big game herds.

Approximately 0.5% of nongame and small mammal habitats would be disturbed as a result of regional oil and gas development projects (i.e., developments in the CBGA, MDPA, and GWAA). The potential future addition of 900 wells within the CBGA would increase this loss of habitat to approximately 1.4%. Overall, cumulative impacts to these mammals would be considered negligible.

4.2.3.2 Birds

Significance Criteria. Impacts to birds would be considered significant if project-related activities resulted in:

- a loss of greater than 5% of either raptor foraging or raptor nesting habitat within the CBGA;
- any disruption of raptor breeding activity within the CBGA that would result in reproductive failure;
- a loss of greater than 1% of existing sage grouse probable nesting habitat within the combined WGFD South Wamsutter and Sierra Madre upland game bird management areas;
- continuous disruption of sage grouse breeding activity within the CBGA; or
- a loss of greater than 5% of existing species-specific nongame bird habitat within the CBGA.

Proposed Action. The principal threat to raptors from project activities is disturbance during nesting. Potential conflicts between active nest sites and project-related activities would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that no significant impacts would occur to raptors or their nesting success. A raptor nesting survey of the CBGA will be conducted in late May 1994, to document the status of raptor nests in the area, and future surveys would be conducted as needed to ensure that appropriate mitigation measures (e.g., avoidance) are stipulated during APD and ROW application reviews.

Table 4.3 Potential Initial and LOP Disturbances Within Regional Wildlife Habitats for the Proposed Action, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Wildlife Resource	Acreage of Wildlife Habitat Within the Region	Acreage of Disturbance Within Wildlife Habitats		Percentage of Wildlife Habitats Disturbed Within the Region	
		New [1]	LOP [2]	New [3]	LOP [4]
Pronghorn					
Bitter Creek herd					
Crucial winter/yearlong range	220,608.0[5]	184.7	332.9	<0.1	0.2
Winter/yearlong range	1,644,800.0[6]	783.8	1,412.3	<0.1	<0.1
Baggs herd					
Crucial winter/yearlong range	96,896.0[5]	174.7	314.9	0.2	0.3
Winter/yearlong range	307,136.0[6]	104.8	188.9	<0.1	<0.1
Mule deer					
Baggs herd					
Crucial winter and crucial winter/yearlong range	259,392.0[7]	164.7	296.9	<0.1	0.1
Winter/yearlong range	1,438,528.0[6]	1,083.3	1,952.1	<0.1	0.1
Elk					
Sierra Madre herd					
Winter range	278,208.0[8]	154.8	278.9	<0.1	0.1
Sage grouse					
Probable nesting habitat	227,243.0[9]	634.0	1,142.5	0.3	0.5
Potential breeding habitat[10]	3,550.0[9]	0	0	0	0

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[1] Assumes 4.99 acres of new disturbance for each well from well pad, roads, pipelines, and ancillary facilities.

[2] Assumes 8.99 acres of LOP disturbance for each well from well pad, roads, pipelines, and ancillary facilities.

[3] Percent new disturbance = (total new disturbance/total acreage of resource) x 100.

[4] Percent LOP disturbance = (total LOP disturbance/total acreage of resource) x 100.

[5] Total area of crucial winter/yearlong range for herd.

[6] Total area of winter/yearlong range for herd.

[7] Total area of crucial winter range and winter/yearlong range for herd.

[8] Total area of winter range for herd.

[9] Adapted from Medicine Bow-Divide Resource Area RMP data (BLM 1987:200) for the WGFD South Wamsutter and Sierra Madre upland game bird management areas.

[10] Sage grouse breeding habitat would be avoided.

A total of 119 well locations occur within potential raptor nesting buffers (within 0.75 mi of known raptor nests) on the CBGA. Specific nest activity status will be identified during the 1994 survey, and these data will be presented in the FEIS for this project. If all known nests are considered active (a very unlikely scenario), loss of raptor nest buffer habitat due to the proposed action would be approximately 0.7% of that available on the CBGA; LOP habitat loss would be 1.2% of that available (Table 4.2). However, potential raptor nesting conflicts resulting from the proposed project would be resolved through consultations as described above, and therefore, impacts are not anticipated to be significant.

Raptors, primarily golden eagles and ferruginous hawks, occasionally construct nests on well site facilities in Wyoming (personal communication, January 1992, with Bob Tigner, Planning and Environmental Specialist, BLM). In the event raptors nest on production/operation facilities, artificial nesting structures will be provided as directed by the BLM in consultation with the USFWS. Artificial nesting structures have been successfully used by eagles and ferruginous hawks in the region (Call and Tigner 1991). SOCO and other CBGA operators would cooperate in the erection of artificial nesting structures.

Reduction in raptor prey species is not anticipated to be a major concern since disturbance would be scattered throughout the CBGA. Therefore, the reduction in prey species would occur over a relatively large number of potential raptor territories, limiting prey reduction to negligible levels in any one territory.

One hundred twenty-seven of the 250 proposed wells (51%) would occur within probable nesting habitat associated with known sage grouse leks within and immediately adjacent to the CBGA. This would result in an initial disturbance of 634 acres of this habitat, or 0.4% of the probable nesting habitat within the CBGA. The LOP disturbance would be 1,143 acres, or 0.8% of this habitat within the CBGA. No well locations would be situated within the 5,018 acres of potential breeding habitat on the CBGA (Table 4.2). A standard BLM wildlife stipulation requires that no activity or surface disturbance be allowed within 0.25 mi of an existing sage grouse lek center; however, the Authorized Officer, in consultation with the WGFD, may grant exceptions to this stipulation. Leks located immediately adjacent to existing roads could experience some disturbance from increased traffic due to project activity. Impacts to sage grouse associated with the proposed action are expected to be moderate.

While nongame birds would be negatively affected by increased human activity on the CBGA, primary effects would occur in direct proportion to the amount of a species' habitat removed. Since total initial surface disturbance represents only 0.6% of the CBGA and rare habitats (e.g., wetlands) would be avoided where possible, impacts to these populations are expected to be negligible for most species. With the inclusion of some existing disturbance on the CBGA, LOP habitat loss for these species would increase to 1.1%. A slight increase in mortality from increased traffic is expected, but would also be negligible. If birds (e.g., wading/shorebirds and waterfowl) are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances as determined by the BLM, appropriate measures to restrict access (e.g., netting, pool covers) would be employed to assure that impacts to birds are minimized and remain negligible for the LOP.

Alternative 1. Impacts to habitats used by raptors, sage grouse, and other birds would decrease by about 30% under Alternative 1 from those identified for the proposed action (Table 4.2). Impact levels are expected to be the same as those identified for the proposed action since identical mitigation measures would be employed.

Alternative 2. Impacts to habitats used by raptors, sage grouse, and other birds would increase by about 20% under Alternative 2 from those identified for the proposed action (Table 4.2). Impact levels are expected to be consistent with those of the proposed action since the same mitigations would be employed.

Approximately 0.7% of potential raptor habitat within the CBGA (1,496 acres) would be initially disturbed under this alternative; LOP disturbance including some existing disturbance would be 1.3% (2,695 acres) (Table 4.2). Approximately 0.8% (712 acres) of potential raptor nesting buffer within the CBGA would be initially disturbed under this Alternative 2; LOP disturbance would be 1,283 acres (1.4% of that available).

Seven hundred sixty acres of probable sage grouse nesting habitat would be initially disturbed under this alternative, or 0.5% of that available on the CBGA. The LOP disturbance would be 1,369 acres, or 0.9% of that available. Although there would be a slight increase in the amount of nesting habitat disturbed under this alternative, along with an increase in traffic effects on breeding birds, impacts to sage grouse should remain moderate.

Removal of nongame bird habitat would increase under this alternative to 0.7% of the CBGA (1.3% for the LOP). Impacts to birds are anticipated to remain negligible under this alternative.

No Action. No increased impacts to bird populations above existing levels would occur under the no action alternative.

Cumulative Impacts. Given the extensive area covered by the combined CBGA, MDPA, and GWAA and the application of mitigation measures, cumulative impacts to potential raptor habitat resulting from regional oil and gas projects would likely be negligible. Stipulations protecting raptor nests would protect these resources on the CBGA, MDPA, and GWAA and avoid additional undesirable impacts to the surrounding areawide populations of nesting raptors affected by other current or foreseen activities.

Approximately 0.3% of probable sage grouse nesting habitat within the combined WGFD South Wamsutter and Sierra Madre upland game bird management areas would be directly impacted by surface disturbance from the proposed project (Table 4.3). LOP disturbance would be approximately 0.5% of probable sage grouse nesting habitat for the combined management areas. Inclusion of disturbance associated with development of the MDPA and GWAA would bring total disturbance levels in the combined project areas to less than 1.0% of that available. The proposed development in the CBGA would not significantly increase the cumulative impacts to probable sage grouse nesting habitat in the combined project areas. Stipulations protecting sage grouse leks would protect these resources on the CBGA, MDPA, and GWAA and avoid additional undesirable impacts to the surrounding areawide populations of sage grouse affected by other current or foreseen activities. Cumulative impacts to sage grouse are anticipated to be moderate.

The potential future addition of 900 wells within the CBGA would result in further disturbance to raptors and sage grouse; this future action could result in significant impacts to these and other bird populations if standard stipulations for the protection of their crucial habitats are not met.

Approximately 1.4% of regional nongame bird habitats would be disturbed as a result of past and present developments in the CBGA, MDPA, and GWAA. Overall, cumulative impacts to bird populations within the region are anticipated to be negligible.

4.2.3.3 Amphibians and Reptiles

Significance Criteria. Impacts to amphibians and reptiles would be considered significant if project-related activities resulted in a loss of greater than 5% of existing species-specific amphibian and reptile habitat within the CBGA.

Proposed Action. While amphibians and reptiles would be negatively affected by increased human activity in the CBGA, primary effects would occur in direct proportion to the amount of a species' habitat removed. Impacts to these species would be negligible, since total initial surface disturbance resulting from the proposed action represents only 0.6% of the CBGA, and with the inclusion of some existing disturbance, disturbance levels would increase to only 1.1% for the LOP. In addition, rare or important habitats (e.g., wetlands, denning sites) would be avoided where possible. A slight increase in mortality from increased traffic in the CBGA is expected but would also be negligible. Projectwide mitigation measures (see Section 2.1.5), including the avoidance of wetland areas (i.e., crucial amphibian habitat) during project development, would further reduce project impacts to amphibian species.

Alternative 1. Impacts to habitats used by amphibians and reptiles under this alternative would decrease by about 30% from levels identified for the proposed action. Therefore, impact levels would likely remain negligible.

Alternative 2. Impacts to habitats used by amphibians and reptiles would increase by about 20% under this alternative. Removal of amphibian and reptile habitat would increase under this alternative to 0.7% of the CBGA (1.3% for the LOP). However, since the same mitigations would be employed under Alternative 2 as under the proposed action, impacts to amphibians and reptiles would likely remain negligible.

No Action. No significant impacts would occur to amphibian and reptile populations under this alternative since no additional development would occur.

Cumulative Impacts. Approximately 1.4% of regional amphibian and reptile habitats would be disturbed as a result of past and present development projects in the combined CBGA, MDPA, and GWAA project area (Table 4.1). With the application of standard wetland and other habitat protection measures, cumulative impacts to amphibian and reptile populations within the region are expected to be negligible.

4.2.3.4 Fisheries

Significance Criteria. Impacts to fisheries would be considered significant if project-related activities resulted in the degradation of any surface water such that its WGFD Stream Classification (WGFD 1987) was permanently reduced.

Proposed Action. Initial construction and drilling activities may degrade water quality due to increased sedimentation and runoff. This potential impact would likely be negligible with the implementation of proper erosion control mitigations (see Section 4.1.7.2) and would remain moderate throughout the LOP. In addition, the avoidance of wetland areas would further minimize potential fisheries impacts.

Alternative 1. Impacts to fisheries under Alternative 1 would likely remain moderate for the LOP, since the total area of disturbance would be reduced by approximately 30% from that of the proposed action, and the same mitigation measures would be applied.

Alternative 2. Impacts to fisheries under Alternative 2, although potentially greater than those for the proposed action, would, with the implementation of appropriate avoidance and mitigation measures, likely remain moderate for the LOP.

No Action. No additional impacts beyond existing levels would occur to fisheries under the no action alternative since no additional development would occur.

Cumulative Impacts. Since all regional oil and gas development projects seek to employ proper erosion control and construction techniques, cumulative impacts to fisheries would likely be moderate.

4.2.4 Wild Horses

4.2.4.1 Significance Criteria

Impacts to wild horses would be considered significant if project-related activities resulted in:

- nonattainment or a permanent reduction (greater than 5%) of wild horse populations below BLM management levels;
- a loss of greater than 5% of the existing wild horse range within the Flat Top HMA; or
- permanent displacement or direct mortality of greater than 5% of all wild horses on the CBGA due to habitat disturbance or other activities of man.

4.2.4.2 Proposed Action

Loss of forage and intrusion by humans would affect bands of wild horses on the CBGA. It is anticipated that wild horses would move at least a short distance away from active drilling areas, causing temporary displacement and disruption to wild horse bands on limited sites. This would be a short-term, moderate impact to individual horses at well locations during construction, drilling, and completion, but a negligible impact to the Flat Top Herd as a whole.

Wild horses often become accustomed to vehicular traffic and to man at minimal levels and would intermingle in areas where wells are in operation (personal communication, February 1992, with Teryl Shryack, Range Conservationist, BLM, Great Divide Resource Area). Horses would continue to use the CBGA when wells are completed and producing. Therefore, operation and maintenance of wells would result in negligible impacts on wild horses during the LOP.

Approximately 694 acres of range within the Flat Top HMA would be disturbed as a result of the proposed action; this is approximately 0.9% of the Flat Top HMA within the CBGA. LOP disturbance would be about 1,250 acres, or 1.7% of the resource within the CBGA. Following initial reclamation and habituation of wild horses to activity in the area, it is anticipated that this disturbance would have a negligible impact on attainment of wild horse population objectives for the Flat Top HMA or future Adobe Town HMA.

Although vegetation is relatively sparse, range condition is considered to be generally good within the CBGA. Revegetation would begin as soon as areas are no longer required for safe and efficient project operation. Upon project completion, all surface equipment would be removed from the CBGA, and all disturbed sites would be reclaimed to restore ground cover and forage species. Only a relatively small amount of forage would be lost through initial removal of vegetation, and the temporary conversion of some areas from shrublands to grasslands would likely be beneficial to wild horses; therefore, impacts to wild horses through loss of forage would be negligible.

Water resources within the CBGA would not be depleted nor would they be contaminated by the proposed action. Field personnel would be instructed not to harm horses and to minimize disturbance to wild horse bands, especially during known stress periods such as breeding and foaling seasons. No significant long-term impact to wild horses would occur as a result of the proposed action.

4.2.4.3 Alternative 1

The amount of disturbance within wild horse range on the CBGA under Alternative 1 would be reduced by approximately 30% of that of the proposed action. Approximately 450 acres of wild horse habitat within the Flat Top HMA on the CBGA would be disturbed under Alternative 1. This disturbance represents 0.6% of the Flat Top HMA on the CBGA. LOP disturbance would be approximately 878 acres, or 1.2% of this resource on the CBGA.

As with the proposed action, it is anticipated that impacts to wild horse populations on the CBGA due to this alternative would be moderate during construction and negligible for the LOP. The same mitigation measures as applied for the proposed action would be implemented under Alternative 1.

4.2.4.4 Alternative 2

The level of disturbance within wild horse range on the CBGA under Alternative 2 would be increased by about 20% over that of the proposed action. Approximately 832 acres (1.1%) of the Flat Top HMA on the CBGA would initially be disturbed. LOP disturbance would total 1,496 acres, or 2.0% of this HMA on the CBGA.

Although overall impacts to wild horses on the CBGA would increase under this alternative, it is anticipated that impacts would remain moderate during construction and negligible for the LOP.

4.2.4.5 No Action

No increased impacts beyond existing levels would occur to wild horse populations under the no action alternative since no additional disturbance would occur.

4.2.4.6 Cumulative Impacts

Less than 0.3% of wild horse range for the Flat Top HMA would be directly impacted by surface disturbance from the proposed project. LOP disturbance, which includes a portion of currently existing disturbance, would be approximately 0.5% of wild horse range for the Flat Top HMA. The proposed development in the CBGA would not significantly increase the cumulative impacts to Flat Top HMA wild horse range.

The potential future inclusion of the Flat Top HMA within the Adobe Town HMA would add disturbance associated with the Mulligan Draw Gas Field Project (BLM 1992c). However, cumulative impacts to the Adobe Town HMA are anticipated to remain moderate to negligible since similar mitigation measures would be applied in both areas.

The potential addition of 900 wells within the CBGA would result in increased disturbance within wild horse range on the Flat Top or future Adobe Town HMA; this future action could result in significant impacts (e.g., permanent displacement, range loss) to wild horse populations in these HMAs.

4.2.5 Threatened and Endangered/State Sensitive Species

4.2.5.1 Significance Criteria

Impacts to T&E, candidate, and state sensitive species would be considered significant if project-related activities resulted in:

- the mortality or permanent displacement of any listed or candidate T&E species;
- the disturbance of designated critical habitat for listed or candidate T&E species; or
- the nonattainment or substantial deceleration of T&E, candidate, or state sensitive species recovery programs.

4.2.5.2 Proposed Action

Bald eagles and peregrine falcons may occasionally use the CBGA for foraging during winter or migrations, but no known nests or roosting areas have been reported in the CBGA. No adverse impacts to bald eagles roosts along the Little Snake River south of the CBGA are anticipated. No adverse impacts to bald eagles or peregrine falcons that potentially hunt on the CBGA are expected. In the event that bald eagle or peregrine falcon nests or roosts are discovered on the CBGA, the BLM, USFWS, and WGFD would be consulted, and appropriate mitigation measures would be implemented to ensure that no impacts occur to these species.

Although no confirmed black-footed ferret sightings have been recorded for the CBGA, potential habitat may exist in white-tailed prairie dog colonies in the area. If sufficient acreage and density of prairie dog colonies are present to constitute potential black-footed ferret habitat in areas proposed for disturbance, a survey per USFWS guidelines (USFWS 1989) would be conducted. Surveys would be implemented during APD and/or ROW reviews on a site-specific basis. In the unlikely event that black-footed ferrets are discovered during surveys, consultation and coordination with the USFWS would be required to ensure that no adverse impacts to the black-footed ferret result from the proposed action.

Although no potential conflict between active ferruginous hawk nest sites and project activity is anticipated at present, any that may arise during the project would be resolved by the BLM, in consultation with the USFWS and WGFD, to ensure that no impacts would occur to the species. Surveys would be conducted to document the status of ferruginous hawk and other raptor nests so that appropriate protective measures are stipulated during APD and ROW reviews. Loss of potential loggerhead shrike and mountain plover foraging and nesting habitat may occur due to the proposed activities; however, due to the scattered nature of habitat disturbance, it is anticipated that these species would not be permanently displaced. Aquatic birds such as the black tern and the white-faced ibis are not likely to be impacted by proposed project activities since most wetland areas would be avoided. In addition, pre-construction surveys for candidate species would be conducted during APD and ROW application reviews, and if candidate species are noted in areas to be disturbed, these locations would be avoided until such time as project construction would not affect these species (e.g., post-nesting).

T&E, candidate, and sensitive species occurring downstream of the CBGA within the Colorado River system are not anticipated to be adversely affected by the proposed project since only minimal amounts of surface water may be used. A BA identifying the potential effect of surface water withdrawals on downstream T&E and candidate fish species and appropriate mitigation measures for these species is being prepared and will be available for review in June 1994 at the BLM Great Divide Resource Area and Rawlins District Offices. T&E and candidate fish species occurring within CBGA surface waters would be further protected from adverse impacts by the avoidance of wetland areas and the use of proper and adequate erosion control techniques.

State sensitive plant and animal species have been reported within and adjacent to the CBGA (Table 3.9). However, since project development and operations would be performed in a manner to minimize disturbing potential habitat for these species, overall impact would be negligible.

4.2.5.3 Alternative 1

There would be no adverse affects to T&E species under Alternative 1, and impacts to state sensitive plant and animal species are expected to be negligible. The same mitigation measures as those identified for the proposed action would be implemented under Alternative 1. Approximately 30% less land disturbance would occur under Alternative 1 than that identified for the proposed action.

4.2.5.4 Alternative 2

Although surface disturbance would increase by approximately 20% under Alternative 2, it is anticipated that there would be no adverse affects to T&E species. Impacts to state sensitive plant and animal species under Alternative 2 are expected to be negligible.

4.2.5.5 No Action Alternative

No impacts to T&E, candidate, and state sensitive plant and animal species would occur under the no action alternative.

4.2.5.6 Cumulative Impacts

Given that appropriate monitoring and mitigation measures for T&E, candidate, and state sensitive species would be employed throughout regional oil and gas development projects, it is anticipated that there would be no adverse cumulative effects to these species resulting from the implementation of the proposed project. The potential future addition of 900 wells on the CBGA could adversely affect some T&E and state sensitive species if increased activity and surface disturbance preclude the use of large areas by these species.

4.3 CULTURAL AND HISTORICAL RESOURCES

4.3.1 Significance Criteria

Significant impacts to cultural and/or historic resources would occur if project activities result in:

- noncompliance with procedures and objectives identified in the Great Divide Resource Area RMP and ROD (BLM 1987:36-37, 1990a:11) for implementing federal cultural resource management practices;
- destruction or alteration of all or a contributing part of an NRHP eligible cultural or historic site;
- the isolation of a cultural resource from its surrounding environment;
- the introduction of visual, audible, or atmospheric elements that are out of character with an NRHP eligible site or would alter its setting;
- the neglect and subsequent deterioration of an NRHP eligible site;
- surface-disturbing activities within 0.25 mi of contributing segments of historical trails unless such disturbance is not visible from the trail or occurs within an existing visual intrusion; or
- disturbance of important sites of religious or cultural significance to Native Americans.

4.3.2 Proposed Action

Potential direct impacts to NRHP cultural properties would primarily result from construction-related activities; however, since these potential impacts would be mitigated on a case-by-case basis as determined during site-specific APD and ROW reviews, following procedures specified in the National Historic Preservation Act (36 CFR 800), impacts would be negligible. File searches and Class III inventories would be conducted on all state and federal lands and on private lands affected by federal undertakings unless landowner denial for access is documented in writing. All resources identified in Class III surveys would be evaluated for eligibility for the NRHP in consultation with the BLM and SHPO.

Potential impacts to specific eligible or unevaluated properties are unknown at this time, and given that high cultural resource site densities (i.e., greater than 30 sites per section) are known from the CBGA, it is likely that project construction activities would uncover cultural resource sites, and some of these sites would be NRHP eligible. Eligible or listed sites identified in the file search and Class III inventories would be avoided as would areas with high potential for significant cultural deposits, such as aeolian deposits, alluvial deposits along major drainages and terraces, and colluvial deposits at the base of low slopes and hills, where possible. If any NRHP (eligible or listed) prehistoric sites found within proposed disturbance areas cannot be avoided, a data recovery program would be implemented. When required, construction activities would be monitored by a qualified BLM-permitted archaeologist. If historic or prehistoric materials are discovered during construction, all activities within an area defined by the Authorized Officer would cease immediately, and appropriate BLM personnel would be notified by SOCO and/or other area operators or their subcontractors to assure proper handling of the discovery by qualified archaeologists. SOCO and the other area operators would be responsible for mitigation or avoidance of impacts to cultural resources discovered during construction, as deemed appropriate by the BLM, SHPO, and Advisory Council on Historic Preservation.

Contributing historic trail segments would be avoided on federal and private lands (subject to landowner preference or agreement) as necessary during construction. To provide a protective corridor for historic trails within the CBGA, general visual intrusion and surface disturbance would be restricted or prohibited within 0.25 mi or within the visual horizon, whichever is closer.

Indirect impacts to cultural resources, including the unauthorized collection of artifacts, would be negligible since inventories and monitoring would locate most significant sites within and adjacent to disturbance areas. Potential impacts would be reduced through informing all field personnel of the importance of the resources and the regulatory obligations to protect such resources. All SOCO and other CBGA operator personnel employed for the proposed action would be instructed that collection of cultural materials is prohibited and against the law.

Initial consultations with Native American groups indicated that no religious or culturally important areas for Native Americans occur in the CBGA and further consultations with these groups may be conducted. If religious or culturally important sites are identified, the BLM would review the potential impacts to determine what measures are necessary to prevent or mitigate significant impacts to religious or culturally important areas. The surveys to determine the presence of eligible cultural resources and mitigations required to comply with the regulations and stipulations would assure that overall impacts to cultural resources from the proposed action would be negligible.

4.3.3 Alternative 1

Potential impacts to cultural and historic resources under Alternative 1 would be similar but reduced by approximately 30% from those described for the proposed action. With the implementation of mitigation measures as identified for the proposed action, impacts would remain at negligible levels.

4.3.4 Alternative 2

Potential impacts to cultural and historic resources under Alternative 2 would be similar but increased by approximately 20% from those described for the proposed action. With the implementation of mitigation measures as identified for the proposed action, impacts would remain at negligible levels.

4.3.5 No Action

Under the no action alternative, no additional impacts to cultural and historic resources beyond currently existing levels would occur, since no additional ground-disturbing activities would be implemented. Unauthorized collection of artifacts would continue at existing levels.

4.3.6 Cumulative Impacts

Disturbance and/or loss of unidentified sites or artifacts could add to the cumulative loss of information about our heritage in the CBGA and throughout the region if these resources are not identified, inventoried, and/or appropriately protected prior to disturbance. However, such losses are not expected since mitigation measures as identified for the proposed action would be implemented under all proposed and potential future regional oil and gas development projects.

4.4 SOCIOECONOMICS

4.4.1 Significance Criteria

Impacts to socioeconomic features would be considered significant if project-related activities resulted in:

- population growth beyond the capacity of communities to provide adequate housing and services, or otherwise adapt to growth-related social and economic changes;

- revenue flows and expenditures by local, county, or state governments that are inadequate to maintain public services and facilities at established levels;
- any permanent displacement of residents or users of affected areas; or
- perceived changes in existing ways of life resulting in community discontent sufficient to create organizational response and conflict.

4.4.2 Proposed Action

Population changes in both Carbon and Sweetwater Counties due to the project would be negligible and of relatively short duration. There would be a beneficial effect on local employment and local economies throughout the LOP, especially during drilling and construction when as many as 180 people may be required (Table 2.2). The drill rigs would employ both local and transient personnel. It is not possible to determine where drill crews will live. Local drill crews would, by definition, already reside in the area; typically, transient workers on drill rigs are not accompanied by their families, and it is unlikely that they would permanently relocate to the communities potentially affected by the development. Baggs and Wamsutter are the closest communities, but Rawlins, which is larger and offers more services, is approximately 30 mi from the CBGA and may be selected by some of the employees. Several employees currently working in the CBGA live in Baggs, and the additional employees for the operating phase of the proposed action would likely also live in Baggs.

Local communities would experience beneficial economic impacts through an increase in consumption of local goods and services (e.g., earthwork on well locations and roads is usually contracted to local construction companies, and it is likely that employees would spend some of their payroll in these communities), decreased vacancy rates, and increased sales tax revenues. Most of these beneficial impacts would be short-term during drilling and construction, but benefits would continue at lower levels throughout the LOP.

Estimated state and local taxes and federal royalties on the gross revenue from gas and oil production in the first 25 years of the LOP are given in Table 4.4. Additional revenue would be generated through the property taxes on surface facilities and sales and use taxes paid for equipment. Wyoming and the affected counties have been adversely affected due to the decline in mineral revenues the past several years, and the added revenue due to the proposed action would help offset some of the budget shortfall.

Adverse effects may occur during drilling activities on a localized basis if too many workers concentrate in a small town, such as Baggs, such that infrastructure and services cannot meet the demand; however, these impacts, if they occur at all, are expected to be negligible and short-term due to the mobility of the workforce and availability of alternative communities with increased excess capacity. Crime may potentially increase, and local sheriff and police departments would have additional population in their jurisdiction. There may be a minor increase in need for law enforcement services. The WGFD may need to increase enforcement activities in the CBGA because improved access would allow poachers to travel more easily through areas not previously patrolled by the WGFD due to poor access. SOCO and other CBGA operators have committed to educating employees regarding WGFD wildlife rules and regulations of the area, and operator personnel would support WGFD surveillance in the area by immediately reporting all observed illegal harvest of wildlife on the CBGA.

The infrastructure of all communities within commuting distance of the CBGA would be able to accommodate the workers and their families during drilling operations. Sufficient motels and temporary housing are present within commuting distance of the CBGA for use by the workers; therefore, adverse impacts would be negligible.

Table 4.4 Estimated Oil and Gas Production, State and Local Severance Taxes, and Federal Royalties for the First 25 Years of Operation, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.[1]

Year	Gas Production (mmcf)[7]	Gas Price[2] ($/mcf)[8]	Oil Production (mbbl)[9]	Oil Price[3] ($/bbl)[10]	State and Local Taxes[4] ($ x 1,000)	Federal Royalty[5] ($ x 1,000)	Local Services and Payroll Expenses[6] ($ x 1,000)
1994	0	1.80	0	15.90	0	0	1,500
1995	5,215	1.89	52.2	16.70	1,431	939	3,360
1996	13,970	1.98	139.7	17.53	4,017	2,635	4,134
1997	20,375	2.08	203.8	18.41	6,155	4,037	1,984
1998	15,280	2.19	152.8	19.33	4,859	3,186	2,084
1999	12,873	2.30	128.7	20.29	4,299	2,819	2,188
2000	11,347	2.41	113.5	21.31	3,971	2,604	2,297
2001	10,228	2.53	102.3	22.37	3,758	2,464	2,412
2002	9,313	2.66	93.1	23.49	3,597	2,359	2,533
2003	8,517	2.79	85.2	24.67	3,451	2,263	2,659
2004	7,819	2.93	78.2	25.90	3,327	2,182	2,792
2005	7,177	3.08	71.8	27.19	3,210	2,105	2,932
2006	6,589	3.23	65.9	28.55	3,090	2,027	3,079
2007	6,049	3.39	60.5	29.98	2,978	1,953	3,233
2008	5,553	3.56	55.5	31.48	2,871	1,883	3,394
2009	5,097	3.74	51.0	33.05	2,768	1,815	3,564
2010	4,679	3.93	46.8	34.71	2,670	1,751	3,742
2011	4,296	4.00	43.0	36.00	2,499	1,639	3,900
2012	3,943	4.00	39.4	36.00	2,293	1,504	3,900
2013	3,620	4.00	36.2	36.00	2,106	1,381	3,900
2014	3,323	4.00	33.2	36.00	1,933	1,268	3,900
2015	3,051	4.00	30.5	36.00	1,775	1,164	3,900
2016	2,801	4.00	28.0	36.00	1,629	1,069	3,900
2017	2,571	4.00	25.7	36.00	1,495	981	3,900
2018	2,360	4.00	23.6	36.00	1,373	900	3,900
2019	2,167	4.00	21.7	36.00	1,261	827	3,900
Average		3.17		28.26			3,319
Total	178,213		1,782.3		72,816	47,755	82,987

[1] Based on personal communication January 1994, with Tim Morris, SOCO.

[2] Gas price is based on the average fourth quarter 1993 price escalated at a 5% annual rate through 2010.

[3] Oil price is based on the average fourth quarter 1993 price escalated at a 5% annual rate through 2010.

[4] State and local taxes are assumed to be a 6.0015% and 7.34%, respectively, on all revenue.

[5] Based on 175 wells on federal lands with a 12.5% royalty interest.

[6] Includes such expenses as earthwork, water hauling, surveying, and drilling crew, fracturing crew, and maintenance personnel salaries escalated at a 5% annual rate through 2010.

[7] mmcf = million cubic feet.

[8] $/mcf = price per 1,000 cubic feet.

[9] mbbl = thousand barrels.

[10] $/bbl = price per barrel.

The towns potentially impacted by the project have developed in a boom-bust mode, and the short-term increase in population associated with the proposed action would not adversely impact the character of the communities.

Upon completion of drilling, the drill rigs and their crews would be released, which may result in emigration and/or the return of local unemployment rates to near pre-project levels.

An increase in travel on access roads to the CBGA may adversely affect traffic safety during drilling and construction. SOCO and other area operators would educate employees regarding safe operations of vehicles on the CBGA (e.g., appropriate speed limits, potentially hazardous situations), and with the proper design of roads, potential impacts to public safety would be reduced. Roads used frequently by trucks, equipment, and workers traveling to the CBGA would require increased maintenance for the LOP. All non-state and non-county roads in the CBGA developed or improved for the proposed action would be maintained by SOCO and the other area operators, as necessary, to ensure safety and prevent degradation of the transportation system. Road maintenance agreements among area operators would be prepared. These agreements would identify which operators would maintain the various roads and the extent and timing of maintenance requirements. All road maintenance agreements would be submitted to the BLM upon request.

4.4.3 Alternative 1

Socioeconomic impacts under Alternative 1 would generally be the same as described for the proposed action. No significant adverse impacts are anticipated under this alternative.

4.4.4 Alternative 2

Socioeconomic impacts under Alternative 2 would generally be the same as described for the proposed action; however, there would be additional personnel and payroll associated with the employment of crews to drill and operate additional wells. There would be additional short-term demands on housing, but there are sufficient vacant units in Rawlins, Baggs, and Wamsutter to accommodate the additional personnel. No significant adverse socioeconomic impacts are anticipated under this alternative.

4.4.5 No Action

If the proposed project were not undertaken, natural gas and oil reserves in the area would not be developed, and the state, region, and local communities would not benefit from the increased economic activity and income. Many of these communities would remain in a state of economic depression.

4.4.6 Cumulative Impacts

The availability of temporary housing and current regional infrastructures would allow the proposed project (as well as future increases in project size) along with other regional developments in the MDPA and GWAA to be conducted simultaneously without adversely affecting available resources. Sufficient motels, empty trailer spaces, and vacant housing are available within commuting distance of the CBGA, MDPA, and GWAA. Communities in the region have experienced significant population declines in the past and have sufficient existing infrastructures to accommodate proposed and potential future personnel working in the region. The basic character of existing communities would not be changed due to the additional people working on the area. There would likely be an increased demand for law enforcement, including WGFD personnel, due to the increased number of people associated with the various projects. Increased law enforcement along access roads may be necessary to maintain transportation safety due to potential increases in traffic volumes.

The cumulative impacts on the local economy, tax base, and revenues due to the CBGA development and other existing, proposed, and potential future projects in the region would be beneficial. The economies of local communities have been depressed due to recent reductions in jobs, populations, and revenues, so stimulation of the economy associated with the payrolls, taxes, and royalty revenues from these projects would be beneficial and offset these reductions.

4.5 LAND USE

4.5.1 Significance Criteria

Impacts to land use would be considered significant if project-related activities resulted in:

- a greater than 10% permanent reduction in AUMs on any single grazing allotment; or
- a permanent reduction in recreational opportunities within the CBGA.

4.5.2 Proposed Action

No permanent changes in land use would occur within the CBGA; all surface equipment would be removed from the area upon project completion, and reclamation would restore disturbed sites to near pre-project conditions. The project is in conformance with county, state, and/or federal land use plans and other management plans.

Approximately 1,248 acres (0.6%) of the CBGA would be initially disturbed by the proposed action (Table 2.1). Initial reclamation following drilling and construction would reduce this initial disturbance to 558 acres (0.3%). With the inclusion of a portion of existing disturbance, approximately 2,249 acres, or 1.1% of the CBGA, would be disturbed for the LOP. Disturbance associated with project activities would be dispersed over approximately 325 mi^2, thereby distributing disturbances to livestock, wildlife, wild horses, and outdoor recreation over the entire CBGA. The project would temporarily displace or interfere with some historical land uses on a localized basis as described below.

4.5.2.1 Agriculture/Rangeland

Livestock grazing would continue within the CBGA during all phases of the project. However, there would be some minor reduction in forage in areas where drilling is occurring. Actual loss of AUMs, if 0.6% of the CBGA would be disturbed initially and 1.1% would be disturbed over the LOP, would be 166.5 AUMs initially and 299.9 AUMs over the LOP for the CBGA. The greatest loss of AUMs for a single grazing allotment would occur within the Headquarters Ranch Allotment; 25.0 AUMs (2.5%) would be lost initially, and 44.8 AUMs (4.4%) would be lost for the LOP. Total impacts to AUMs, and impacts within any single allotment, are both considered negligible.

Mitigation for loss of forage would entail the reclamation of disturbed sites to range conditions equal to or better than pre-project conditions. As soon as practicable, reclamation and revegetation would begin on areas no longer needed for safe project operations. In addition, pipelines would be constructed such that livestock are not denied access to water sources and pipeline trenches would not present a hazard to livestock. Long-term effects to grazing and general livestock use would therefore be negligible.

4.5.2.2 Developed Water Resources

All well locations would be situated a minimum of 500 ft from perennial impoundments and 100 ft from ephemeral impoundments to avoid potential impacts to these resources (see Section 4.2.2). Impacts to developed water resources would be negligible.

4.5.2.3 Extractive Mineral Operations/Oil and Gas Production

Existing leasable and locatable mineral reserves on the CBGA are not currently economically recoverable; therefore, negligible impacts to mineral operations would result from the project. The removal of natural gas and oil reserves from the CBGA would impart a loss of these reserves for future generations; however, the intent of the project is to develop gas and oil reserves present within the CBGA and is consistent with current

4.5.2.4 Recreation

No developed recreation sites or facilities exist within the CBGA. Numerous dispersed recreational activities are available throughout the year; however, the number of individuals and amount of recreation time spent in the CBGA are not known. Most BLM-managed lands on the CBGA shall remain open for public use for the LOP. Areas where public access would be denied for safety reasons include well locations and ancillary facility sites.

During the drilling and construction phase, noise, dust, traffic, the presence of equipment, and associated human activities would change the character of the area and diminish recreational experiences, such as backcountry hiking and camping, wild horse and wildlife observation, horseback riding, nature photography, big game hunting, and ORV use. With the application of mitigation measures identified in Sections 4.2.1, 4.2.3, and 4.6, impacts would initially be moderate. Once drilling and construction have been completed and equipment and human activity are reduced to levels necessary for production, impacts to recreation would be negligible for the LOP. Wildlife and wild horses would continue to use the area and would, for the most part, adapt to changes brought about by construction. With improved access to the CBGA, poaching and disturbance of big game may increase slightly. In addition, areas proximal to well locations and other facilities may be avoided by some hunters and may negatively affect hunter recreational experiences. However, increased accessibility throughout the CBGA would enhance opportunities for hunting and wildlife and wild horse observation for some recreational users.

All surface equipment and structures would be removed upon project completion. All well locations, selected roads, and other disturbed sites would be reclaimed to reestablish wildlife habitat and restore the area for recreational use. Some roads may be retained upon project completion allowing increased recreational use of the area.

4.5.2.5 Land Status and Prior Rights

SOCO and other area operators have the appropriate leases to develop gas and oil reserves throughout the CBGA, and proposed operations would not infringe on existing CBGA ROWs; therefore, there would be a negligible impact on prior rights in the CBGA. Existing power lines and pipelines would be avoided, where practical, during construction. The 166.5 AUMs lost during construction and drilling and the total of 299.9 AUMs lost during the LOP would not require a reduction in stocking rates, so there would be a negligible infringement on the rights of grazing permittees.

4.5.3 Alternative 1

The amount of disturbance within the CBGA under Alternative 1 would be reduced by approximately 30% from that of the proposed action. Total AUMs initially lost under this alternative would be 117.2 (0.4% of total AUMs within the CBGA); LOP loss would be 210.5 AUMs (0.8%). Impacts under this alternative would be similar to those for the proposed action, and since the same mitigation measures would be applied, no significant impacts are anticipated.

4.5.4 Alternative 2

The level of disturbance within the CBGA under Alternative 2 would be increased by about 20% over that of the proposed action. Initial loss of AUMs under this alternative would be 199.8 (0.8% of the existing AUMs); LOP loss would be 359.1 AUMs (1.4%). The greatest loss within a single grazing allotment would occur within the Headquarters Ranch Allotment; 30.0 AUMs (2.9%) would be lost initially, and 53.7 AUMs (5.3%) would be lost for the LOP. Impacts associated with this alternative would be similar, although slightly greater, than those described for the proposed action; however, with the implementation of mitigation measures as under the proposed action, no significant impacts are anticipated.

4.5.5 No Action Alternative

No impacts would occur to land use activities under the no action alternative, since no disturbance beyond existing levels would occur.

4.5.6 Cumulative Impacts

Grazing allotments within and adjacent to the CBGA would not be affected by development operations in the MDPA and GWAA; therefore, the proposed action would likely have a negligible cumulative effect on grazing in the area. However, the potential future development of an addition 900 well locations within the CBGA could result in significant cumulative impacts to grazing within specific allotments and the area as a whole.

The development of the CBGA in combination with other current and future development projects in the region would increase demands for and impacts on recreational resources. Operation of the CBGA field would have a minimal cumulative impact due to the small number of people involved in production activities (7 to 14) (Table 2.2). Recreational opportunities could be significantly impacted if 900 additional wells are developed; increased big game displacement would likely occur, which would limit hunting success, and the character of the area could be changed such that dispersed outdoor recreational activities would be impacted.

Overall, cumulative impacts to land uses within the CBGA would be similar to those associated with the proposed action, since the same mitigation measures would be applied. However, substantial future increases in the number of well locations within the CBGA could result in significant cumulative impacts to land use activities within the area.

4.6 VISUAL RESOURCES

4.6.1 Significance Criteria

Impacts to visual resources would be considered significant if development activities caused a violation of the BLM VRM objectives specified in the Great Divide Resource Area RMP (BLM 1987:64). Violations would include dominant visual changes in line, form, color, and/or texture in VRM Class III areas of the CBGA as viewed by a casual observer.

4.6.2 Proposed Action

Approximately 172 wells would be located in VRM Class IV areas. Since the change to the characteristic landscape can be high in this class, the proposed development is consistent with the management goals for these areas. Impacts to visual resources in VRM Class IV areas would be negligible for the LOP and beyond. An estimated 78 well locations would occur in VRM Class III areas which allow for moderate alteration of the natural landscape character, provided the action does not dominate the view of a casual observer. Of the 78 well locations, 32 would be located in the foreground-middleground field of view, four would be in the background, and 42 would be in seldom-seen areas.

Because well locations would be situated on a 160-acre spacing pattern, several well locations could be viewed simultaneously, and this would represent a moderate change in landscape character. However, because of the wide vistas available in the CBGA, well locations are not likely to dominate any single field of view, and thus, impacts would not be significant. During selection of well locations, consideration would be given to prevent any one well location or combination of locations from dominating a particular view.

A total of 78 well locations would occur in seldom-seen areas. While the VRM Class III and IV areas allow for development, the aesthetic character of seldom-seen areas would be reduced by the proposed development. The impact would not affect casual observers but would affect recreational users who target these more remote areas. Because few people use these areas, and development in these areas is consistent with the RMP, impacts would not be significant.

Careful mitigation would minimize contrast within the CBGA, making wells, roads, pipelines, and ancillary facilities less noticeable during the LOP. Tanks and equipment would be painted Carlsbad Canyon Brown or Desert Brown to blend with the surrounding landscape; well locations, roads, pipelines, and other linear intrusions would be located and designed to blend with topographic features, thereby reducing the visual contrast between these structures and the natural elements of the surrounding landscape. Additionally, portions of well locations not used during production, pipeline corridors, and other disturbed sites would be reclaimed and revegetated, as soon as possible. These mitigation measures should maintain the VRM standards for the CBGA.

Upon project completion, most visual signs of the project would be removed, most disturbed areas would be revegetated, and most roads would be reclaimed. Permanent impacts to visual resources would be consistent with the management goals for Class III and Class IV visual resource areas.

4.6.3 Alternative 1

If the relative proportions of wells in each VRM Class and distance category would remain the same as for the proposed action, approximately 120 wells locations would occur in VRM Class IV areas, and 54 would occur in VRM Class III areas. Since there would be approximately 30% fewer well locations under Alternative 1, visual impacts would be less than those of the proposed action, and thus, impacts would be moderate or negligible for the LOP.

4.6.4 Alternative 2

If the relative proportions of wells in each VRM Class and distance category would remain the same as for the proposed action, approximately 224 well locations would occur in VRM Class IV areas, and 102 would occur in the VRM Class III areas. Both 160-acre and 80-acre spacing patterns (i.e., eight wells per section) would be used, and significant visual impacts could occur in VRM Class III areas with an 80-acre spacing pattern, since the locations could dominate the view of a casual observer in foreground-middleground distances.

Where possible, the 80-acre spacing pattern would not be employed in VRM Class III foreground-middleground areas. This would prevent well locations from dominating the landscape in the most easily observed VRM Class III areas. Potential significant impacts could occur under Alternative 2 because a greater number of well locations are proposed. By avoiding using an 80-acre spacing pattern in foreground-middleground distances of Class III areas, impacts to visual resources would be moderate or negligible for the LOP and beyond.

4.6.5 No Action

Under the no action alternative, there would be no impacts to visual resources beyond those existing in the CBGA, since there would be no additional development in the area.

4.6.6 Cumulative Impacts

There is the potential for significant cumulative visual resource impacts resulting from proposed and potential future developments in the CBGA, MDPA, and GWAA. While developments in the MDPA and GWAA involve only relatively small new areas of disturbance (Table 4.1), developments within the CBGA, including the 248 existing well locations, 300 proposed well locations (under Alternative 2), and 900 potential future well locations, could impart significant visual resource impacts to the region.

Significant cumulative impacts would occur if new well locations are situated such that they dominate views within VRM Class III areas. Eight wells per section would likely dominate the field of view of a casual observer in foreground-middleground distances, and would therefore violate the objectives of VRM Class III areas.

4.7 HAZARDOUS MATERIALS

4.7.1 Significance Criteria

Impacts resulting from the use of hazardous materials by the proposed project would be significant if these materials are produced, used, stored, transported, or disposed of in violation of either the Hazardous Materials Management Plan for the proposed project or existing Spill Prevention Control and Countermeasure Plans (see Appendix B). The Hazardous Materials Management Plan will be available for review at the BLM Great Divide Resource Area and Rawlins District Offices in June 1994, and will be included in the FEIS for this project.

4.7.2 Proposed Action

Impacts to soils, surface and groundwater resources, and wildlife could result from accidental hazardous material spills, pipeline ruptures, and/or exposure of these materials to wildlife. Any spills would be cleaned up and the contaminated soils disposed of or rehabilitated as specified in the Spill Prevention and Control and Countermeasure Plans (see Appendix B). The small amount of soil that could potentially be contaminated coupled with appropriate and timely cleanup would result in negligible potential soil impacts from accidental spills. Proper containment of oil and fuel in storage areas, containment of fluids in reserve pits, appropriate pipeline design and construction, and locating wells away from drainages would limit potential surface and groundwater contamination to negligible levels. If nongame and small mammals are attracted to and use any of the reserve pits or other localities that contain potentially harmful substances, appropriate measures to restrict access (e.g., netting, pool covers) would be employed to assure that impacts to wildlife are minimized and remain negligible for the LOP. All reserve pits would be lined, fenced, and netted as deemed appropriate by the BLM.

Since project operations would comply with all relevant federal and state laws regarding hazardous materials and with directives identified in the Hazardous Materials and Management Plan for this project and existing Spill Prevention Control and Countermeasure Plans (see Appendix B), no significant impacts are anticipated.

4.7.3 Alternative 1

The potential for hazardous material impacts under Alternative 1 would be reduced by approximately 30% from that of the proposed action. Since the same mitigation measures would be applied, no significant impacts are anticipated.

4.7.4 Alternative 2

The potential for hazardous material impacts under Alternative 2 would be approximately 20% greater than that of the proposed action. However, with the implementation of mitigations as identified for the proposed action, no significant impacts are anticipated.

4.7.5 No Action

Under the no action alternative, there would be no new impacts from hazardous materials since no additional hazardous materials would be produced, used, stored, transported, or disposed of as a result of the project.

4.7.6 Cumulative Impacts

All the proposed regional oil and gas development projects would use mitigation measures similar to or more stringent than those described for the proposed action to prevent soil contamination, surface and groundwater pollution, and wildlife exposure; therefore, impacts are expected to be negligible.

4.8 UNAVOIDABLE ADVERSE EFFECTS

The mitigation measures incorporated in the project description and identified throughout the preceding discussion of impacts would avoid or minimize many of the potential adverse effects; however, not all adverse effects can be avoided, nor is mitigation 100% effective in remediating all nor is mitigation 100% effective in remediating all impacts. There would be at least a minimal amount of unavoidable adverse effect on all resources present in the CBGA for at least a short time, due to the presence of equipment and humans in the area and the time necessary for mitigation to be effective (e.g., reclamation). No significant unavoidable adverse impacts are anticipated from the proposed project.

4.9 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible and irretrievable impact is defined as a permanent reduction or loss of a resource that once lost cannot be regained. The primary irreversible and irretrievable commitment of resources from the proposed project would result from removal and use of the gas and oil reserves in the Mesaverde Group. Water produced prior to and during gas production would eventually be replaced as the aquifers recharge from surface infiltration in recharge areas.

The soil lost through wind and water erosion would also be an irreversible and irretrievable loss from the CBGA.

The loss of productivity (i.e., forage, wildlife habitat) from lands devoted to project activities (i.e., well locations, roads) would be an irreversible and irretrievable commitment during the time that those lands are out of production and until they are revegetated. Most of the land would be returned to production after reclamation and revegetation; however, the vegetation community may take more than 20 years after the LOP to recover.

Inadvertent or accidental destruction of paleontological or cultural resources during construction would be an irreversible and irretrievable loss, but it is not likely to be a significant impact since the chance of encountering these resources in the small area disturbed by construction is limited and archaeological and paleontological data recovery and monitoring activities would be conducted as deemed appropriate by the BLM.

Animals killed during earthmoving activities or through collisions with vehicles are irreversibly and irretrievably lost. Impacts associated with this loss would be negligible.

There would be an irreversible and irretrievable commitment of the energy used during construction, drilling, production, and reclamation associated with the project. Pipelines and materials used for casing and cementing wells would be permanent and would be abandoned in place. They cannot be recovered due to practical or economic considerations, so they would be irreversibly and irretrievably committed.

4.10 SHORT-TERM USE OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

For purposes of this discussion, short-term use of the environment is that use during the LOP, and long-term productivity refers to the period after the project is completed and the area reclaimed.

The short-term use of the environment would affect the resources as discussed in Section 4.1 through 4.7 above. This use and associated impacts would not significantly affect the long-term productivity of the CBGA or adjacent areas. After the project is completed and disturbed areas reclaimed, the same resources that were present prior to the project would be available, except for the oil and gas that were removed. It may take 20 years or more after the LOP for some of the reclaimed areas to revegetate; however, reclamation would provide conditions to support wildlife, livestock, and recreation. Use of the CBGA during the LOP would not preclude the subsequent long-term use of the area for any purpose for which it was originally suited prior to the project.

5.0 MITIGATION AND MONITORING

The mitigation and monitoring measures identified in this chapter have been summarized from materials presented in Section 2.1.5, and Chapter 4.0, and Appendix A. Measures were developed in response to impacts identified in Chapter 4.0 and during the scoping process. Mitigation and monitoring measures describe how project activities would be implemented to assure compliance with resource management goals and objectives for the CBGA, applicable lease stipulations, and additional environmental protection goals identified in IDT analyses. All mitigation and monitoring measures identified in this chapter would be applied to the proposed action, Alternative 1, or Alternative 2.

The BLM Great Divide Resource Area Manager would be the Authorized Officer for the proposed project. Mitigation and monitoring measures identified in this chapter may be modified by the Authorized Officer based on new information or to further minimize impacts. IDT recommendations would be developed during field site analyses, conducted during APD and ROW reviews, and presented to the Authorized Officer. Final mitigation and monitoring requirements would be determined by the Authorized Officer.

Authorization to proceed with the implementation of this project on public lands would be contingent upon receiving from SOCO and the other area operators site-specific transportation, reclamation, and monitoring plans and USFWS concurrence on the T&E species impact analysis. Site-specific plans (e.g., ERRPs) would be developed when APD, ROW applications, etc. are received. Concurrent IDT on-site environmental reviews may also be conducted.

Approval of individual project components (i.e., wells, roads, pipelines, and ancillary facilities) for the CBGA would be contingent upon completion of a site-specific cultural resource file search and Class III cultural clearance, paleontological clearance, site-specific EAs, and Decision Records for each well, road, pipeline, or other facility unless otherwise provided by the Authorized Officer. Construction, operation, and monitoring plans as well as ERRPs may also be required before project approval would be granted for specific project development activities.

The Authorized Officer, in consultation with other agency personnel (e.g., WGFD, USFWS), would approve, on a case-by-case basis, the initiation of well location construction, drilling, completion, and production facility installation when sensitive resource constraints (e.g., wildlife) are involved. This action would allow project activities to proceed in areas and/or during periods of restriction if deemed appropriate by the Authorized Officer (e.g., mild winters, abandoned raptor nest sites, etc.). Exceptions would be granted only in cases where adherence to lease and/or unit area stipulations is not possible or necessary and the proposed action is acceptable with proper mitigation. CBGA operators are encouraged to submit APDs and ROW applications for development activities on crucial winter ranges such that there is sufficient time to complete all activities prior to critical winter periods.

Except for cultural resources, mitigation and monitoring measures identified would be adhered to on both federal and private lands affected by federal undertakings, subject to landowner preferences or agreements. Mitigation for cultural resources would be applied on all public lands and on private lands affected by federal undertakings, unless landowner denial for access is documented in writing.

5.1 MITIGATION MEASURES

5.1.1 Administrative Requirements

All phases of the proposed project including well location, road, and pipeline construction, drilling and completion operations, maintenance, and reclamation would be conducted by SOCO and the other area operators and their subcontractors in full compliance with all applicable federal, state, and local laws and regulations and within the guidelines specified in approved APDs, ROW permits, and site-specific EAs and Decision Records (i.e., individual well location, road, pipeline, and ancillary facility EAs).

Reclamation plans (e.g., ERRPs) would be provided as components of APDs and ROW applications according to guidelines established in Onshore Oil and Gas Order No. 1 and other criteria established by the BLM. These reclamation plans would detail all practices necessary for reclamation on areas not required for production operations (i.e., unused portions of well locations, 19 ft of road ROWs, and entire pipeline ROWs outside road ROWs). Plans would include configurations of the reshaped topography and drainage systems, segregation of spoil materials, surface manipulations, waste disposal practices, soil treatments, and species lists, and would incorporate the material applicable to reclamation presented in Chapters 2.0 and 4.0. An estimate of the time for commencement and completion of reclamation operations would also be included. Similar reclamation plans would be prepared upon abandonment of production facilities.

Applicable lease stipulations developed or applied to CBGA activities would be adhered to during all proposed activities, unless a BLM-approved written exception has been granted. Exceptions would be granted only in cases where adherence to stipulations is not possible or necessary, and the proposed development is acceptable with proper mitigation. Public review of lease stipulation modification, waiver, or exception may be granted when deemed appropriate by the Authorized Officer. Lease stipulations may provide further mitigation and monitoring criteria that have not been identified in this EIS; these criteria would be addressed as specified above. Examples of lease stipulations that would be applied on some areas of the CBGA are provided in Appendix A.

5.1.2 Preconstruction Planning and Design

Site-specific recommendations and mitigations would be developed by SOCO, other area operators, and the BLM or other landowner based on site inspections of each proposed action site. These sites include new roads and roads designated for improvement, well locations, pipelines, and ancillary facilities. The final location of each site would be specifically evaluated through the APD, ROW application, and site-specific EA and Decision Record processes. In addition, prior to the approval of any APD or ROW application, adequate reclamation plans for existing, unnecessary, on-lease disturbed areas would be required by the BLM.

Any proposed activity or surface disturbance (e.g., construction activities such as roads, well locations, pipelines, etc.) would be accompanied by appropriate engineering design specifications, geotechnical analyses, mitigation plans, etc. This information would be of sufficient detail to demonstrate that all environmental resources would be adequately protected or that impacts to them would be adequately mitigated.

The following areas or situations may require more detailed or complex designs, plans, or analyses:

- slopes in excess of 25%;
- areas within 500 ft of surface water and/or wetland areas;
- areas within 100 ft of ephemeral/intermittent drainages;
- areas on unstable soils;
- construction with frozen material or during periods when soil material is saturated or when watershed damage is likely to occur;
- construction activities in crucial wildlife habitats (e.g., crucial winter ranges); and
- construction at sites where cultural or paleontological resources are present.

All sources of aggregate for construction materials necessary for well locations, road construction, road improvement, and maintenance would be identified by SOCO and the other area operators. The appropriate surface management agency (BLM, State of Wyoming) must approve the sources and times of extraction.

5.1.2.1 Transportation Plan

Preliminary road design plans are addressed in Section 2.1.2.1. Existing roads in the CBGA would be considered first for use as collector, local, and resource roads. These roads would be utilized whenever possible in lieu of new construction because the BLM will not foster the proliferation of separate ROWs or perpetuate duplicate road systems on public lands. A preliminary road design plan for the CBGA is shown on Map 2.1. Standards for road design would be consistent with BLM road standards manual (BLM 1985, 1991a), and a BLM District Engineer would approve road design plans.

Individual road design plans for new and/or improved roads would be submitted for approval as components of APDs or ROW permits. All new and improved roads would adhere to BLM road design and construction guidelines, and plans must be approved prior to initiation of work. SOCO and the other area operators would schedule a review of plans with sufficient time to obtain BLM approval prior to commencement of work. Additionally, all roads on public lands not required for project operation and maintenance or existing area activities would be recontoured, reseeded, and permanently blocked, where possible. Roads on private lands would be similarly treated, subject to landowner preference or agreement.

SOCO and the other area operators would be responsible for necessary preventative and corrective road maintenance for the duration of the project. Maintenance responsibilities may include, but are not limited to, blading, gravel surfacing, cleaning ditches and drainage facilities, dust abatement, noxious weed control, or other requirements as directed by the Authorized Officer.

SOCO and the other area operators are required to develop joint road use agreements designating road development, maintenance, and use requirements by area users (e.g., SOCO, Amoco, EOG). The road use agreements would identify responsibilities for necessary preventative and corrective road maintenance throughout the LOP.

5.1.2.2 Drill Site Design Plans

In conformance with Onshore Oil and Gas Order No. 1, SOCO and the other area operators would prepare and submit individual comprehensive drill site design plans for BLM approval. These plans would show the drill location layout over the existing topography, dimensions of the location, volumes and cross sections of cut and fill, location and dimensions of reserve pits, existing drainage patterns, and access road egress and ingress. Plans shall be submitted and approved prior to initiation of construction.

5.1.2.3 Hazardous Material Containment

All storage batteries constructed as components of the project, including drain sumps and sludge holdings at compressor facilities, would be surrounded by a containment dike of sufficient capacity to contain the entire storage capacity of the largest facility plus one foot of freeboard. Notice of any spill or leakage (i.e., undesirable event), as defined in BLM NTL 3A, would be immediately given by SOCO or other operators to the Authorized Officer and other such federal and state officials (e.g., WDEQ) as required by law. Any oral notice shall be given as soon as possible, but within 24 hours, and oral notices shall be confirmed in writing within 72 hours of any such occurrence.

All project activities shall be in compliance with the Hazardous Materials Management Plan for this project and SOCO and the other area operators' Spill Prevention Control and Countermeasure

Plans (see Appendix B). The Hazardous Materials Management Plan will be available for review at the BLM Great Divide Resource Area and Rawlins District Offices in June 1994, and the plan will be presented in an appendix to the FEIS for this project.

5.1.2.4 Erosion Control, Restoration, and Revegetation Plans

Prior to construction, SOCO and the other area operators would submit individual site-specific reclamation plans (i.e., ERRPs) for each well location, road, and pipeline. Specific details on the content of the plans would be as described in Section 5.1.1. Potential species for use in reclamation of disturbed areas are listed in Table 5.1.

5.1.2.5 Stormwater Pollution Prevention Plan

SOCO and the other area operators would prepare for the WDEQ-WQD Stormwater Pollution Prevention Plans for activities requiring disturbances of greater than 50 acres. These plans will identify best-management practices including erosion and pollution control procedures that would be implemented throughout the LOP to minimize pollution of surface waters.

5.1.3 Resource-specific Requirements

5.1.3.1 Air Quality

Necessary air quality permits to construct, test, and operate facilities have been or would be obtained from the WDEQ-AQD. All internal combustion equipment would be kept in good working order, and open burning of garbage or refuse would be prohibited.

5.1.3.2 Topography

Site selection to avoid, where possible, steep slopes, rugged topography, and perennial and ephemeral/intermittent drainages and to minimize the area disturbed is the mitigation measure for reducing impacts to topography.

5.1.3.3 Minerals

The loss of access to potential mineral resources would be mitigated by avoiding areas of known accessible reserves, where possible. If coal or uranium mining on the CBGA becomes economical in the future, additional mitigations may be developed by the BLM.

5.1.3.4 Geologic Hazards

Wells, pipelines, and ancillary facilities would be designed and constructed such that moderate earthquakes would not damage these features. The probability of a severe earthquake occurring during the LOP is negligible.

Activities within potential landslide areas or on slopes greater than 25% would be avoided where possible. Unavoidable disturbance of these areas would be reviewed on a site-specific basis by the BLM during the APD and/or ROW application processes.

To mitigate potential impacts caused by flooding during the LOP, construction in flood-prone areas would be limited to late summer, fall, or winter when conditions are generally dry and streamflows are low. Additional mitigation to lessen any impacts from flooding or high flows during and after construction would include the avoidance of areas with high erosion potential (i.e., steep slopes, floodplains, unstable soils); reestablishment of existing contours where possible; avoidance of areas within 500 ft of open water and 100 ft of ephemeral/intermittent drainage channels where possible; and implementation of appropriate erosion and sediment control and revegetation procedures as identified in ERRPs.

To prevent reactivation of dunes, these areas would be avoided where possible, and areas necessarily disturbed would be seeded as soon as practical using an appropriate seed mixture. If deemed appropriate by the BLM, disturbed areas would be mulched or otherwise protected to prevent wind erosion and facilitate plant establishment.

Table 5.1 List of Plant Species Suitable for Use in Revegetating Disturbed Areas, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Growth Form	Alkaline Soil Species	Non-Alkaline Soil Species
Grasses	Alkali sacaton	Bluebunch wheatgrass
	Sand dropseed	Thickspike wheatgrass
	Bottlebrush squirreltail	Slender wheatgrass
		Western wheatgrass
		Basin wildrye
		Sandberg bluegrass
		Needle-and-thread grass
		Crested wheatgrass (introduced)
		Russian wildrye (introduced)
Forbs	Scarlet globemallow	Scarlet globemallow
	Onion springparsley	Onion springparsley
	Desert parsley	Desert parsley
	Hoods phlox	Aster species
	Prairie onion	Prairie onion
	Englemann daisy	Plains wallflower
	Evening primrose	Fleabane species
		Englemann daisy
		Wild buckwheat species
		Phlox species
		Evening primrose
		Lewis flax
		Penstemon species
Shrubs	Spiney hopsage	Common winterfat
	Gardner's saltbush	Antelope bitterbrush
	Shadscale saltbush	Greasewood
	Fourwing saltbush	Birdfoot sagebrush
		Big sagebrush

5.1.3.5 Paleontological Resources

The potential paleontological value of construction sites would be assessed by BLM personnel during preconstruction. Paleontological surveys of disturbance areas would be conducted as determined by the BLM to ensure that significant paleontological resources are avoided or recovered prior to construction. If monitoring during construction is necessary, a BLM-qualified paleontologist would be required to be on site during construction activities to mitigate direct and indirect impacts to significant paleontological resources. Paleontological surveys, data recovery, and monitoring would be conducted in accordance with BLM guidelines (BLM 1993e).

Any paleontological resource discovered on public land by SOCO or other area operators or any person working on their behalf would be immediately reported to the Authorized Officer. SOCO or other area operators would immediately suspend all operations at the site until authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery would be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant resources. SOCO and/or other area operators would be responsible for the cost of evaluation, and any decision as to proper mitigation measures would be made by the Authorized Officer after consulting with SOCO and/or other area operator.

5.1.3.6 Soils

Adverse impacts to soils would be mitigated by minimizing disturbance; avoiding construction with frozen soil materials; avoiding areas with high erosion potential (e.g., unstable soils, dunal areas, slopes greater than 25%, floodplains), where possible; salvaging and selectively handling topsoil from disturbed areas; adequately protecting stockpiled topsoil using temporary vegetation cover or other appropriate means, and replacing it on the surface during reclamation; leaving the soil intact (scalping only) during pipeline construction, where possible; using appropriate erosion and sedimentation control techniques including, but not limited to, diversion terraces, riprap, and matting; and promptly revegetating disturbed areas using adapted species. Temporary erosion control measures such as temporary vegetation cover; application of mulch, netting, or soil stabilizers; and/or construction of barriers may be used in some areas to minimize wind and water erosion and sedimentation prior to vegetation establishment. Specific measures and locations would be specified in ERRPs prepared during the APD and/or ROW application processes.

Where feasible, pipeline ROWs would be located immediately adjacent to and partially within road ROWs to avoid creating separate areas of disturbance and to reduce the overall disturbance area. Disturbance to revegetated cuts and fills along existing roads would be minimized.

Appropriate erosion control and revegetation measures would be employed. Grading and landscaping would be used to minimize slopes, and water bars would be installed on disturbed slopes with grades of 6% or greater and may be installed on disturbed slopes with grades of less than 6% in areas with unstable soils where seeding alone would not adequately control erosion. Erosion control efforts would be monitored by the BLM and area operators and augmented as necessary to control erosion.

Sufficient topsoil or other suitable material to facilitate revegetation would be segregated from subsoils during all construction operations requiring excavation and would be returned to the surface upon completion of operations. Topsoil stockpiles would be revegetated or otherwise protected to prevent erosion and maintain some soil microflora and microfauna. Soils compacted during construction would be ripped and tilled as necessary prior to reseeding. Cut and fill sections on all roads and along pipelines would be revegetated with indigenous or BLM-approved, adapted species.

Any accidental soil contamination by spills of petroleum products or other hazardous materials would be cleaned up and the soil disposed of or rehabilitated as specified in the Spill Prevention Control and Countermeasure Plans (see Appendix B).

5.1.3.7 Water Resources

Surface Water. SOCO and other area operators would minimize disturbance in the vicinity of streams by avoiding impacts within 500 ft of open waters and wetlands, and within 100 ft of intermittent or ephemeral drainages, where possible. In addition, waterspreader dikes and channels would be avoided, where possible. Culverts would be installed at all appropriate locations as specified in the *Manual 9112-Bridges and Major Culverts* (BLM 1984b) and *Manual 9113-Roads* (BLM 1985, 1991a). Streams would be crossed perpendicular to flow, where possible, and all stream crossing structures would be designed to carry the 25 year discharge event or other capacities as directed by the BLM.

SOCO and other area operators would ensure that state and federal water quality standards would not be exceeded through appropriate disposal of produced water as directed by the WOGCC and BLM, and the prudent use of erosion control measures and timely revegetation of disturbed areas. All disposal of produced water would be approved by the BLM and/or WDEQ.

Guidelines specified in Spill Prevention Control and Countermeasure Plans (see Appendix B) would be adhered to such that any spill or accidental discharge of a hazardous material would be remediated. An orientation would be conducted with responsible or supervisory individuals to ensure that these people are aware of the potential impacts that can result from accidental spills, and that they know the appropriate recourse in the event that a spill occurs. Streams at pipeline crossings would be protected from contamination by a pipeline break with shutoff valves or other systems capable of minimizing accidental discharge.

Erosion-prone or high-salinity areas would be avoided where possible, and necessary construction in these areas would be done in the late summer, fall, and winter to avoid peak runoff periods. Proper containment of oil and produced water in tanks, and drilling fluids in reserve pits, and the location of staging areas for storage of equipment away from drainages would prevent potential contaminants from entering surface waters.

Prudent use of erosion control measures including diversion terraces, riprap, matting, temporary sediment traps, and water bars, in addition to measures described in Section 5.1.3.6, would be employed as necessary. Interceptor dikes would be used to control surface runoff generated at well locations, and dike location and construction methods would be described in drill site design plans. If necessary to reduce suspended sediment loads and remove potential contaminants, SOCO and other area operators would treat diverted water in detention ponds prior to release into undisturbed areas with dense vegetation away from all drainages. Additional water would be discharged onto undisturbed vegetated land or into an established drainage. Prior to discharge, water would be treated or filtered if necessary to reduce contaminant levels and/or reduce suspended particles to meet applicable state or federal standards. If water is discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to convey the increased flow. Waters that do not meet applicable state or federal standards would be evaporated, treated, or disposed of at an approved disposal facility (e.g., Mexican Flats). Stormwater Pollution Prevention Plans would be prepared as necessary.

Groundwater. SOCO and other area operators would construct reserve pits in cut areas or in compacted and stabilized fill. Subsoil material stability and permeability in the area of construction would be evaluated during the APD process and a determination regarding the need for pit reinforcement and/or lining would be made.

All reserve pits would be lined in the following situations:

- where soils would not hold fluids;
- within 500 ft of open water or wetlands;
- within 100 ft of ephemeral or intermittent drainages; or
- where shallow aquifers are likely to be encountered.

These determinations would be made on a case-by-case basis during the APD review process. Where reserve pit fluids contain oil, toxic substances, or other contaminants, SOCO and other area operators would employ approved on-site methods of disposal, or permanent off-site disposal (e.g., Mexican Flats) in accordance with WDEQ regulations.

All wells would be cased and cemented to depths below accessible fresh water zones to prevent cross-contamination of aquifers. Unproductive wells and wells that have completed their intended purpose would be properly abandoned and plugged using procedures identified by the Office of State Oil and Gas Supervisor, Rules and Regulations of WOGCC (1991, 1992a), and the BLM.

Reserve pits would not be reclaimed using the historical method of "squeezing" or mixing pit contents with soil from other areas. Instead, they would be reclaimed using acceptable methods that remove pit liquids through evaporation, utilize approved solidification procedures, or dispose of them at approved and permitted facilities. All methods would be approved by the Authorized Officer.

In regard to the disposal of produced water and water used for testing, water that does not meet applicable state and federal surface water or groundwater standards would not be released on the ground surface. This water would be treated in a lined treatment pond prior to discharge or transported away from well locations to the Mexican Flats or other facility for disposal.

5.1.3.8 Noise and Odor

Noise mitigations would be applied at well locations, as determined necessary on a case-by-case basis by the BLM. All engines required for project activities would be properly muffled and maintained. Construction, drilling, completion, testing, and production facility installation activities would be limited in the vicinity of residences, on crucial big game ranges during critical winter periods, proximal to active raptor nests during the nesting period, and in sage grouse breeding areas. Road use specifications designed to keep traffic to a minimum as identified in site-specific transportation plans would further reduce noise impacts.

No mitigations specifically designed to reduce project odors shall be applied.

5.1.3.9 Vegetation

Removal and disturbance of vegetation would be kept to a minimum through construction site management (e.g., using previously disturbed areas and existing easements, limiting equipment/materials storage yards and staging areas, etc.). Well locations and associated roads and pipelines would be located to avoid and/or minimize impacts in areas of high value (e.g., sensitive plant habitats, wetlands, riparian areas). Vegetation scalping would be employed during pipeline construction, where possible.

Proper erosion and sedimentation control techniques would be incorporated by SOCO and other area operators into the design of well locations, roads, pipelines, and other facilities. Revegetation using a BLM-approved, locally adapted seed mixture containing grasses, forbs, and shrubs would begin in the first appropriate season following disturbance. Vegetation removed would be replaced with plants of equal value using procedures that include:

- fall reseeding (September 15 to freeze-up), where feasible;
- spring reseeding (prior to April 15) if fall seeding is not feasible;
- deep ripping of compacted soils prior to reseeding;
- surface pitting/roughening prior to reseeding;
- utilization of native cool season grasses, forbs, and shrubs in the seed mix;
- utilization of BLM-approved, introduced/adapted species (e.g., crested wheatgrass) in the seed mix on selected areas and after all attempts at vegetation reestablishment with native species are unsuccessful;
- appropriate, BLM-approved weed control techniques;
- broadcast or drill seeding depending on site conditions; and
- fencing of certain reclamation sites (e.g., riparian areas, steep slopes, areas where grazing may affect reclamation success) as determined necessary by the BLM.

Recontouring and seedbed preparation would occur immediately prior to reseeding on the unused portion of well locations, approximately 9.5 ft on both sides of road ROWs, and entire pipeline ROWs outside of road ROWs. In the event of uneconomical wells, SOCO and the other area operators would initiate reclamation of the entire well location, access road, and adjacent disturbed habitat as soon as possible. Reclamation would be monitored annually or as specified in ERRPs to determine and ensure successful establishment of vegetation cover.

SOCO and other area operators would be responsible for implementation of a noxious weed control program in cooperation with the BLM and Carbon or Sweetwater County to ensure noxious weed invasion does not become a problem. Weed-free certification by county extension agents would be required for grain, straw, or hay used for mulching revegetated areas.

Wetlands/Riparian Areas. SOCO and the other area operators would minimize disturbance of wetland and riparian areas by providing a 500 ft vegetation buffer between disturbances and wetland areas, where possible. Established crossings or temporary bridges would be utilized, where possible, and all staging areas would be placed away from wetland sites. Avoidance of wetland areas would be the primary objective.

Where wetland areas must be crossed, as determined during site-specific EA preparation, the primary objective would be soil stabilization through the reestablishment of vegetation cover by native species. Exact procedures and species used would be dependent on site-specific objectives. Compliance with Executive Orders 11988 (floodplain protection) and 11990 (wetland protection) would be assured through consultation with the COE, and the associated Section 404 permitting process.

Further mitigations for disturbed wetland areas would include:

- crossings would be developed only during dry conditions (i.e., late summer, fall, winter);
- areas would be restored to pre-project conditions, and if impermeable soils contributed to wetland formation, soils would be compacted to reestablish impermeability;
- wetland topsoils would be selectively salvaged, stockpiled, and replaced to facilitate the reestablishment of functional wetlands; and
- banks would be recontoured and seeded with BLM-approved, adapted species in the first appropriate season after completion of activities to facilitate soil stabilization.

5.1.3.10 Wildlife and Fisheries

Drilling and construction activities on big game crucial winter and crucial winter/yearlong ranges would be curtailed during critical winter periods (i.e., November 15 through April 30). SOCO and other area operators would schedule drilling programs so that wells located within crucial ranges are constructed, drilled, and completed, and production facilities, including pipelines, are installed during spring, summer, and fall. Typically, when a drilling operation begins, it is allowed to be completed. Decision points for shutdown occur between pad construction and drilling, and between drilling and well production facilities installation.

During the winter, escape openings would be provided along access roads in big game crucial ranges as designated by the BLM and WGFD to facilitate exit of big game animals from snowplowed roads. Some roads on the CBGA may be closed (i.e., gated and locked) to deny unnecessary access during critical winter periods. To minimize displacement and stress of animals, SOCO and the other area operators would instruct workers and contractors that they should avoid stopping and exiting their vehicles in big game winter habitat while there is snow on the ground. Additional on-lease mitigation measures within crucial winter ranges, including various habitat improvement practices, may be negotiated by the BLM to compensate for unavoidable loss of crucial winter range.

All reserve pits would be fenced to prevent big game and livestock access, and reserve pits would be netted (1 inch mesh) as deemed necessary by the BLM. All reserve pits would be backfilled when dry, and for pits identified as containing oil or toxic substances, pit restoration would begin immediately (i.e., within 15 days) after cessation of drilling and testing activities, or pits would be netted. Reserve pit netting would be monitored for effectiveness by the BLM.

Well locations, pipelines, and associated roads would be selected and designed to minimize disturbances to areas of high wildlife value (e.g., wetland areas). All production facilities (e.g., compressors) shall be muffled such that noise levels would not exceed a maximum of 55 dBA at 500 ft. from facilities. No activity or surface disturbance would be allowed within 0.25 mi of a sage grouse lek center at any time. To protect probable sage grouse nesting habitat, no construction or drilling activities would be allowed within 2.0 mi of lek centers between March 1 and June 30. Activities near active raptor nests would be prohibited within a 0.75 mi radius or other distance as necessary to avoid disturbing birds from February 1 through July 31. Mitigation for raptor nests would be designed on a site-specific basis in consultation with the BLM, USFWS, and WGFD. SOCO and other area operators would notify the BLM immediately if raptors are found nesting on project facilities, and operator employees would assist the BLM as necessary in erecting artificial nesting structures.

To minimize wildlife mortality due to vehicle collisions, SOCO and other area operators would advise project personnel regarding appropriate speed limits on the CBGA, and roads would be reclaimed as soon as possible after they are no longer required. Some existing roads on the CBGA may be closed and reclaimed as deemed appropriate by the BLM. In addition, project-required travel would be restricted to only that necessary for efficient project operation on roads located in big game crucial ranges during critical winter months to minimize animal stress. Potential increases in poaching would be minimized through employee and contractor education regarding wildlife laws. If violations are discovered, the offending employee or contractor would be disciplined and may be dismissed.

Potential impacts to fisheries would be minimized by using proper erosion control techniques (see Sections 5.1.3.6, 5.1.3.7, and 5.1.3.9). Construction within 500 ft of open water and 100 ft of intermittent and ephemeral channels would be avoided where possible, and stream crossings would be constructed during the period of lowest flow (i.e., late summer and fall).

5.1.3.11 Wild Horses

Loss of forage would be limited by restricting disturbance to the minimum area necessary to conduct safe operations. Field personnel would be instructed to minimize disturbance to wild horses, especially during known stress periods such as breeding and foaling seasons. Open pits that would be hazardous to horses would be fenced.

5.1.3.12 Threatened and Endangered/State Sensitive Species

White-tailed prairie dog colony location mapping, as well as black-footed ferret surveys, would be conducted if deemed necessary by the BLM in consultation with the USFWS. Determinations would be made on a case-by-case basis during ROW application review and APD processes. Prairie dog colonies on the CBGA would be avoided where possible to minimize disturbance to these areas.

In the event that bald eagle roosting areas are found, a no surface occupancy restriction would be applied to a one mile buffer zone around winter roosts, and the area would be closed to surface-disturbing activities (e.g., construction, drilling) from November 1 through April 1. If active bald eagle or peregrine falcon nests are found, no activity or surface disturbance would be allowed for up to a one mile radius from nests between February 1 and July 31.

Surveys for candidate species would be implemented during on-site inspections of proposed ROWs and well locations conducted as components of ROW application and APD review processes. If candidate species are found on the area, construction activities would be delayed until such activities would not disturb these species. Habitats in which state sensitive species are likely to occur would be avoided where possible.

A BA for the proposed project assessing project impacts to T&E and candidate species is currently being prepared. Copies of the BA will be available for review in June 1994, at the BLM Great Divide Resource Area and Rawlins District Offices.

5.1.3.13 Cultural and Historic Resources

Impacts to cultural resources would be mitigated following procedures as specified in 36 CFR 800. Class I and Class III inventories would be conducted on all federal and state lands and on private lands affected by federal undertakings unless landowner denial for access is documented in writing. Cultural sites identified during those inventories would be avoided, where possible. Areas adjacent to perennial waters and aeolian deposits would also be avoided, where possible. Mitigation measures would be determined by the BLM in consultation with the SHPO, the Advisory Council on Historic Preservation, and SOCO or other area operators. If a large number of sites cannot be avoided, a programmatic agreement among the aforementioned parties may be developed.

Historic trails would be evaluated by a qualified historian, and contributing sections of historic trails would be avoided within 0.25 mi unless such disturbance would not be visible from the trail or would occur in an existing visual intrusion area.

All resources identified in Class III inventories would be evaluated for NRHP eligibility in consultation with the BLM and SHPO. If any NRHP (eligible or listed) site cannot be avoided, a data recovery plan would be implemented as directed by the BLM.

In addition to the Class I and III inventories, construction activities in areas where the BLM believes there is a high potential for buried cultural deposits, would be monitored by a BLM-permitted archaeologist. If historic or prehistoric materials are discovered during construction, further surface disturbing activities at the site would cease immediately, and appropriate BLM personnel would be notified by SOCO, other area operators, or their subcontractor to assure proper handling of the discovery by qualified archaeologists. An evaluation would be made by the Authorized Officer to determine appropriate actions to prevent the loss of significant cultural resources. SOCO or other area operators would be responsible for the cost of the evaluation, and any decision as to proper mitigation measures (e.g., data recovery) would be made by the Authorized Officer after consulting SOCO or the other area operator. In the absence of a programmatic agreement, any discovered historic properties would be subject to mitigation through data recovery.

Any cultural resource (historic or prehistoric site or object) discovered on public land by SOCO, other operators, or any person working on their behalf would be immediately reported to the Authorized Officer. Field personnel would be instructed not to disturb cultural resource sites or collect artifacts, and those caught disturbing cultural resources or collecting artifacts may be dismissed and prosecuted.

If any area of religious or cultural importance to Native American groups is identified on public lands, the BLM would review the potential impacts on a site-specific basis to determine appropriate mitigation measures.

5.1.3.14 Socioeconomics

SOCO and other area operators are encouraged to implement policies that use existing local labor.

SOCO and other area operators would schedule concentrations of project traffic, such as truck convoys or heavy traffic flows, to avoid periods of expected heavy traffic flows associated with recreation (e.g., opening day of pronghorn season). Travel and parking would be restricted to access roads and on-site parking areas, respectively.

5.1.3.15 Land Use

Reclamation of nonessential areas disturbed during construction activities would be accomplished in the first appropriate season after well completion. Nonessential areas include 1.0 acre of well locations, approximately 19 ft of new road ROWs, entire pipeline ROWs outside of road ROWs, and all roads and associated disturbed areas at nonproductive well locations. SOCO and the other area operators would repair or replace fences and cattle guards, gates, drift fences, and natural barriers to maintain current BLM standards. Cattle guards would be used instead of gates for livestock control on most road ROWs. Livestock would be protected from pipeline trenches, and livestock access to existing water sources would be maintained.

All well locations, unauthorized roads, surface portions of pipelines, and ancillary facilities would be removed upon project completion.

Mitigations to prior rights include:

- limiting drilling operations to lands leased or owned by SOCO or other area operators;
- locating wells away from known underground cables;
- regrading and repairing roads as necessary in areas damaged by project activities;
- reestablishing a level compacted surface where pipelines cross existing roads;
- advance identification and flagging of all existing ROWs that would be crossed by proposed pipelines and roads;
- backhoe and hand excavation at pipeline crossings until the exact locations of underground lines have been determined; and
- restoring native vegetation as soon as practical.

5.1.3.16 Visual Resources

During on-site reviews, the BLM, SOCO, and the other area operators would evaluate potential disturbances to visual resources and identify appropriate mitigations. Revegetation would be initiated as soon as possible after disturbance, pipeline ROWs would be located within existing ROWs whenever possible, and aboveground facilities not requiring safety coloration would be painted with appropriate nonreflective standard environmental colors (Carlsbad Canyon Brown or Desert Brown). Topographic screening, vegetation manipulation, project scheduling, and traffic control procedures would all be employed as deemed appropriate by the BLM to further reduce visual impacts.

5.2 MONITORING

Each area operator would identify an individual to serve as Environmental Compliance Coordinator. The Environmental Compliance Coordinator would be responsible for assuring that mitigation measures are applied and monitoring activities are conducted as necessary to assure impacts are minimized.

5.2.1 Transportation, Pipeline, and Well Location Construction

SOCO, other area operators, and the BLM would provide qualified representatives on the ground during construction to validate construction commensurate with the approved design.

5.2.2 Paleontological Resources

In addition to the predisturbance survey conducted as deemed appropriate by the BLM, specific, unavoidable high-value sites would be monitored as necessary by a qualified paleontologist during construction. If significant paleontological materials are found during construction, all activities at the site would cease immediately, and the Authorized Officer would be notified immediately by SOCO, the other operator, or their subcontractor to assure proper handling of the discovery by a qualified paleontologist.

5.2.3 Soils

SOCO and other area operators would conduct regularly scheduled monitoring of erosion control structures within the CBGA to ensure maintenance of the operating integrity of these structures. Monitoring procedures and schedules would be specified in ERRPs. Appropriate remedial action would be taken by SOCO or other area operators to correct nonfunctioning structures.

5.2.4 Water Resources

SOCO and other area operators would conduct regularly scheduled visual monitoring reconnaissance of surface waters to detect changes in water quality resulting from sedimentation. Periodic water samples would be collected, analyzed, and evaluated to ensure that produced water and water disposal methods, as well as any on-site discharge, are in compliance with federal and state water quality standards. In addition, if waters are discharged to the surface, the quantity of water discharged would be regularly monitored to ensure that releases do not exceed the abilities of existing drainage systems to convey discharge flows. Appropriate remedial actions would be immediately taken to correct any out-of-compliance conditions.

5.2.5 Vegetation

Environmental Compliance Coordinators would monitor activities adjacent to wetlands to ensure that no discharge or fill would disturb these areas. SOCO and other area operators in cooperation with the BLM would be responsible for monitoring revegetation success using criteria specified in ERRPs. The reclamation monitoring program shall include written documentation to be furnished to the BLM regarding the effectiveness and success of reclamation mitigation.

5.2.6 Wildlife and Fisheries

SOCO and other area operators, in cooperation with the BLM, would monitor raptor nesting and sage grouse lek use on and adjacent to the CBGA to ensure that these sensitive resources are protected throughout the LOP. In addition, breeding bird surveys may be required periodically by the BLM. Environmental Compliance Coordinators would also monitor project activity in big game crucial ranges during critical periods to ensure that no unauthorized use occurs and to ensure that authorized activities in these areas are conducted in the most efficient manner possible to limit potential adverse impacts.

Any big game, raptor, or game bird mortalities on the CBGA noted by SOCO or other operators would be reported to the BLM and/or WGFD as soon as practical.

5.2.7 Cultural and Historic Resources

In addition to Class I and Class III inventories, construction activities in areas where the BLM believes there is a high potential for buried cultural deposits would be monitored by a BLM-permitted archaeologist. If historic or prehistoric materials are discovered during construction, all activities at the site would cease immediately, and appropriate BLM personnel would be notified by SOCO, other area operators, or their subcontractor to assure proper handling of the discovery by a qualified archaeologist.

5.2.8 Land Use

Road signs on the CBGA would be maintained and monitored as deemed appropriate by the BLM. SOCO and the other area operators would conduct all maintenance and monitoring operations to ensure that signs are in proper repair and placed in the appropriate locations. Construction monitoring by the BLM may be conducted where proposed pipelines cross existing underground pipeline or cable ROWs on the CBGA.

5.2.9 Hazardous and Solid Waste

Hazardous materials used, produced, transported, stored, and disposed of as a component of this project would be in accordance with all federal and state rules and regulations and the Hazardous Materials Management Plan for this project. This plan will be available for review at the BLM Great Divide Resource Area and Rawlins District Offices in June 1994, and will be included as an appendix to the FEIS for this project.

Any hazardous material spills would be handled as specified in Spill Prevention Control and Countermeasure Plans (see Appendix B). Environmental Compliance Coordinators would be responsible for reporting spills of hazardous materials and implementing applicable procedures, monitoring, and reporting requirements.

All garbage and refuse would be hauled to state-approved sanitary landfills or other disposal sites. SOCO and the other area operators would store garbage and refuse materials collected on site in containers prior to transport.

6.0 CONSULTATION AND PREPARERS

Personnel contacted or consulted during preparation of this EIS are listed in Table 6.1. The list of preparers and participants is given in Table 6.2.

Table 6.1 Personnel Contacted or Consulted, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Agency or Organization	Individual	Position
Amoco	Jan Roberts	Environmental Specialist
Bjork, Seavy, Lindley & Danielson, PC	Laura Lindley	Attorney at Law
Bureau of Land Management		
Great Divide Resource Area	Tim Bottomley	Planning & Environmental Coordinator
	Gary DeMarcay	Archaeologist
	Susan Foley	Soil Scientist
	Ken Henke	Natural Resource Specialist
	Bud Holbrook	Area Manager (retired)
	Larry Jackson	Natural Resource Specialist
	Mark Newman	Geologist
	Kip Purinton	Petroleum Engineer
	Mary Read	Wildlife Biologist
	Chuck Reed	Range Chief
	Teryl Shryack	Range Conservation Officer
	Bill Watters	Multiple Resource Chief
	Jim Webb	Minerals Chief
Rawlins District Office	Mary Apple	Public Affairs
	Dennis Carpenter	Assistant District Manager
	Missy Cook	Environmental Coordinator
	Walt George	Environmental Coordinator
	Ray Hanson	Recreation Planner
	Larry Kmoch	Solid Minerals Chief
	Dick Larsen	Hazardous Materials Specialist
	Bob Tigner	Planning & Environmental Specialist
	Brenda Vosika	Mining Engineer
Casper District Office	Roger Miller	Geohydrologist
Cheyenne State Office	Ranel Capron	Cultural Resource Specialist
	Jerry Carter	Documentation Specialist
	Bill Daniels	Planning & Environmental Coordinator, Branch Chief
	Jon Johnson	Natural Resource Specialist
	Tim Novak	Cultural Resource Specialist
	Joe Patti	Planning & Environmental Specialist
	Roger Wickstrom	Natural Resource Specialist

Table 6.1 (Continued)

Agency or Organization	Individual	Position
Carbon County, Wyoming		
Carbon County Coalition	Steve F. Adams	Director
Carbon County 2000 Action Team	Irene Archibald	Leader
Planning Office	Nina Adams	Planning Director
City of Wamsutter	Susan Carnes Linda Lee	Town Clerk/Treasurer Desert School Secretary
Ensign Oil & Gas, Inc.	Alan C. Amber	Petroleum Consultant
ERA Saulcy Land Co., Inc., Rawlins	Barbara Stapleton	Associate Broker
Heitzman Drill Site Services	Bob Anderson	Project Description Specialist/Biologist
Holson Environmental Planning	Gary Holson	Environmental Scientist
Individuals	Carla Corsi Ray & Kathleen Weber Steve Wolmer	Area Resident Area Residents Soil Scientist
National Wildlife Federation	Tom Doherty Tom Lustig	Wildlife Specialist Wildlife Specialist
Native American Tribes		
Arapahoe Council	Francis Brown Burton Hutchinson	-- Chairman
Shoshone Council	John Tarnesse, Sr. Alfred Ward Haman Wise, Sr.	-- Chairman --
Uinta-Ouray Council	--	Chairman
Ute Mountain Tribe	--	Chairman
Ute Council	Luke Duncan	Chairman
Snyder Oil Corporation	Robin D. Clark Deven Delap Jeff Johnson Tim Morris	Land Technician Production Supervisor Petroleum Engineer Consulting Landman
Sweetwater Economic Development Association, Rock Springs	Den Costantino	Director
Union Pacific Resources Company	Joy Rector	Natural Resource Supervisor
University of Wyoming		
Geology Museum	Brent Breithaupt	Museum Curator/Paleontologist

Table 6.1 (Continued)

Agency or Organization	Individual	Position
U.S. Department of Energy (Laramie)	Ray Spears	Physical Scientist
U.S. Fish and Wildlife Service	Charles P. Davis	State Director
	Steve Brockmann	Fish and Wildlife Biologist
Wyoming Department of Commerce	John T. Keck	State Historic Preservation Office
Wyoming Department of Environmental Quality	Dennis Hemmer	Director
Wyoming Economic Development Office	Ann McGowan	Community Specialist
Wyoming Game and Fish Department	Andrea Cerovaski	Nongame Bird Biologist
	Greg Hiatt	Biologist
	Patrick Hnilicka	Wildlife Biologist
	Lynn Jahnke	Biologist
	Bob Luce	Nongame Biologist
	Bob Oakleaf	Nongame Coordinator
	William Rudd	Biologist
	Bill Wengert	Biologist
	Joe White	Deputy Director
Wyoming Geological Survey	James Case	Geologist
	Gary Glass	State Geologist
Wyoming Natural Diversity Database	Mary Neighbors	Information Manager
Wyoming Public Service Commission	Jon F. Jaquot	Chief Engineer
Wyoming State Engineer's Office	Sue Lowry	Economic Specialist

Table 6.2 List of Preparers and Participants, Creston/Blue Gap Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 1994.

Name	Education/Experience	EIS Responsibility
BLM INTERDISCIPLINARY TEAM		
Mary Apple	B.S. Social Science; 11 years professional experience	Public Affairs
Tim Bottomley	B.S. Forest Management; 15 years professional experience	Environmental Coordinator
Missy Cook	A.A.S.; 7 years professional experience	Clerical, Environmental Coordinator
Sara Crocker	B.S. Range Management; 1 year professional experience	Range
Gary DeMarcay	M.S. Anthropology, B.S. Anthropology; 16 years professional experience	Cultural Resources
Susan Foley	B.S. Range Management; 5 years professional experience	Soils and Watershed
Walt George	M.S. Ecology, B.S. Wildlife Management; 18 years professional experience	Realty/Environmental Coordinator
Ray Hanson	B.S. Environmental Resources; 20 years professional experience	Recreation, Visual Resources
Ken Henke	B.S. Wildlife Biology; 10 years professional experience	Environmental Compliance
Larry Jackson	B.S. Range Management; 20 years professional experience	Environmental Compliance
Dick Larsen	B.S. Forestry, M.S. Soils; 24 years professional experience	Hazardous Materials
Roger Miller	M.S. Geology, B.S. Geology; 29 years professional experience	Geology and Hydrology
Mark Newman	B.S. Geology; 16 years professional experience	Geology and Hydrology
Kip Purinton	B.S. Petroleum Engineering; 4 years professional experience	Petroleum Engineer
Mary Read	M.S. Environmental Science Policy, B.S. Animal Science; 7 years professional experience	Wildlife
Bob Tigner	Ph.D. Environmental Biology, M.S. Wildlife Management, B.S. Game Management; 34 years professional experience	Team Leader

Table 6.2 (Continued)

Name	Education/Experience	EIS Responsibility
HEITZMAN DRILL SITE SERVICES		
Robert Anderson	M.S. Biology and Zoology, B.S. Biology; 13 years professional experience	Project Description Specialist
MARIAH ASSOCIATES, INC.		
Karyn C. Classi	M.S. Botany, M.S. Geology, B.A. Geology; 11 years professional experience	Physical Resources, Vegetation, Visual Resources
Genial G. DeCastro	B.S. Business Administration; 15 years professional experience	Technical Editing, Document Production
Peter J. Guernsey	M.S. Range Management (pend.), B.S. Biology; 11 years professional experience	Project Management, Project Description
William M. Harding	B.A. Anthropology; 9 years professional experience	Cultural and Historic Resources
Carolyn W. Hayden	B.S. Animal Science; 12 years professional experience	Document Production/Coordination
Gary L. Heller	M.S. Zoology and Physiology, B.S. Wildlife Management; 7 years professional experience	Wildlife, Land Use, Socioeconomics, Hazardous Materials
Craig L. Kling	M.S. Wildlife Biology, B.A. Ecology and Wildlife; 19 years professional experience	Quality Assurance, Project Management
Roger A. Schoumacher	M.S. Fisheries; 30 years professional experience	Quality Assurance, Fisheries
Craig S. Smith	M.A. Anthropology, B.A. Anthropology; 17 years professional experience	Cultural Resources

7.0 REFERENCES AND ABBREVIATIONS AND ACRONYMS

7.1 REFERENCES

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7.2 ABBREVIATIONS AND ACRONYMS

ac/AUM	Acres per Animal Unit Month
ac	Acre
Amoco	Amoco Production Company
APD	Application for Permit to Drill
AQD	Air Quality Division, WDEQ
AUM	Animal Unit Month
AUMs/ac	Animal Unit Months per acre
BA	Biological Assessment
bbls	Barrels
BLM	Bureau of Land Management, U.S. Department of the Interior
BP	Before Present
bpd	Barrels per Day
CBGA	Creston/Blue Gap Area
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations. Numbers refer to title and part; that is, 40 CFR 1500 refers to title 40, part 1500
cfs	Cubic Feet per Second
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COE	U.S. Army Corp of Engineers
dBA	Decibel
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EIS	Environmental Impact Statement
EOG	Ensign Oil & Gas New Mexico, Inc.
EPA	U.S. Environmental Protection Agency
ERRP	Erosion Control, Restoration, and Revegetation Plan
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
GWAA	Greater Wamsutter Analysis Area
H_2S	Hydrogen Sulfide
HMA	Herd Management Area, Wild Horse
IDT	Interdisciplinary Team
gpm	Gallons per Minute
LOP	Life of Project (30 to 50 years)
Mariah	Mariah Associates, Inc.
mbbl	Thousand Barrels
mcf	Thousand Cubic Feet
MDPA	Mulligan Draw Project Area
mmcf	Million Cubic Feet
mmcfd	Million Cubic Feet per Day
NEPA	National Environmental Policy Act of 1969
NMHCs	Nonmethane Hydrocarbons
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTL	Notice to Lessees
NWF	National Wildlife Federation

NWI	National Wetlands Inventory
ORV	Off-road Vehicle
pCi/l	Picocuries/liter
ppm	Parts per Million
PSD	Prevention of Significant Deterioration
RCA	Raptor Concentration Area
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SARA	Superfund Amendments and Reauthorization Act
SCS	U.S. Soil Conservation Service
SHPO	Wyoming State Historic Preservation Office
SO_2	Sulphur Dioxide
SOCO	Snyder Oil Corporation
T&E	Threatened and Endangered
TDS	Total Dissolved Solids
TSP	Total Suspended Particulates
UPRC	Union Pacific Resources Company
USDI	U.S. Department of the Interior
USDOC	U.S. Department of Commerce
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VRM	Visual Resource Management
WDEQ	Wyoming Department of Environmental Quality
WDOC	Wyoming Department of Commerce
WDOE	Wyoming Department of Employment
WDR	Wyoming Department of Revenue
WGFD	Wyoming Game and Fish Department
WGS	Wyoming Geological Survey
WOGCC	Wyoming Oil and Gas Conservation Commission
WQD	Water Quality Division, WDEQ
WSEO	Wyoming State Engineer's Office

APPENDIX A:

EXAMPLES OF STIPULATIONS ON FEDERAL LEASES

1. SURFACE DISTURBANCE STIPULATION (used on all leases)

Surface disturbance will be prohibited in any of the following areas or conditions. Modifications to this limitation may be approved in writing by the Authorized Officer.

a. Slopes in excess of 25%.
b. Within important scenic areas (Class I and II Visual Resource Management areas).
c. Within 500 ft of surface water and/or riparian areas.
d. Within 0.25 mi or visual horizon (whichever is closer) of significant sites along historic trails.
e. Construction with frozen material or during periods when the soil material is saturated, frozen, or when watershed damage is likely to occur.

GUIDANCE:

The SURFACE DISTURBANCE STIPULATION will be included on all BLM authorizations. The intent of this stipulation is to inform interested parties (potential lessees, permittees, operators) that, when one or more of the five (a through e) environmental conditions exist, surface disturbing activities will be prohibited unless or until the permittee or his designate representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development and become a condition for approval when authorizing the action.

Specific threshold criteria (e.g., 500 ft from water) have been established based upon the best information available. However, geographical areas and time periods of concern must be delineated at the field level (i.e., "surface water and/or riparian areas" may include both intermittent and ephemeral water sources or may be limited to perennial surface water). "Significant sites along historic trails" refer to those trail segments and sites which have been enrolled in or are eligible for enrollment in the National Register of Historic Places. These decisions, where possible, should be documented in the land use planning documents.

Modification or waive of this stipulation must allow for additional requirements to be applied on a site specific basis, if necessary to mitigate the impacts of concern. Waiver of this stipulation must be based upon demonstration, through environmental analysis, plans of development, plans of operation, Application for Permit to Drill (APD) processing, etc., that the adverse affects will be mitigated or avoided.

WILDLIFE STIPULATION A - winter habitat only applies to this lease.

> To protect important big game ungulate winter habitat, drilling and other surface disturbing activity will not be allowed during the period from November 15 to April 30 within certain areas encompassed by this lease. The same criteria applies to elk calving areas from the period of May 1 to June 30. This limitation does not apply to maintenance and operation of producing wells. Modifications to this limitation in any year may be approved in writing by the Authorized Officer.

WILDLIFE STIPULATION B

> To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, drilling and other surface disturbing activity will not be allowed during the period from February 1 to July 31 within certain areas encompassed by this lease. This limitation does not apply to maintenance and operation of producing wells. Modifications to this limitation in any year may be approved in writing by the Authorized Officer.

GUIDANCE:

The WILDLIFE STIPULATION is intended to provide two basic types of protection, seasonal restriction (a and b) and no surface occupancy (c).

A legal description will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area designated can and should be refined as necessary based upon current biological data at the time the APD or Sundry Notice is processed. It should eventually become a condition for approval in these permits.

The seasonal restriction section of the stipulation identifies three groups of species and delineates two similar time frame restrictions. These two restrictions are big game ungulate and raptors/grouse. The big game ungulates including elk, moose, deer, pronghorn antelope, and bighorn sheep all require protection of crucial winter range between November 15 and April 30. Sage and sharp-tailed grouse and raptors such as eagles, accipiters, falcons, buteos, osprey, burrowing owls, also require nesting protection during periods between February 1 and July 31.

The no surface occupancy section of the stipulation is intended for protection of unique wildlife and wildlife habitat values (e.g., sage grouse strutting grounds, known threatened and endangered species habitat, etc.) which cannot be protected using seasonal restrictions.

APPENDIX B:

SPILL PREVENTION CONTROL AND COUNTERMEASURE PLAN

SPILL PREVENTION CONTROL & COUNTERMEASURE PLAN

PART I
GENERAL INFORMATION

1. Name of Area: Barrel Springs

2. Type of Field: Gas Wells'

3. Location of Field: Carbon County, WY

4. Name and address of owner or operator:

Name: Snyder Oil Corporation

Address: 15 Lash Street
Baggs, Wyoming 82321

5. Designated person accountable for oil spill prevention at facility:

Name and title: Deven Delap, Area Superintendent

6. Facility experienced a reportable oil spill event during the twelve months prior to Jan. 10, 1974 (effective date of 40 CFR, Part 112) (If YES, complete Attachment #1): NO

MANAGEMENT APPROVAL

This SPCC Plan will be implemented as herein described.

Signature H Richard Pate

Name: H. Richard Pate

Title: Division Production Manager

CERTIFICATION

I hereby certify that I have examined the facility, and being familiar with the provisions of 40 CFR, Part 112, attest that this SPCC Plan has been prepared in accordance with good engineering practices.

(Seal)

MARK D. McNAMEE
Printed Name of Registered Professional Engineer

Mark D. McNamee
Signature of Registered Professional Engineer

Date 8/22/91

Registration No. 24788 State Colo.

PART I
GENERAL INFORMATION

7. Potential Spills--Prediction & Control:

Source	Major Type of Failure	Total Quantity (bbls)	Rate (bbls/hr)	Direction of Flow	Secondary Containment
Stock Tank (300 bbl)	-Load Line -Tank Valve -Tank rupture due to lightning strike	300-500 bbl	N/A	N/A	Earthen Dike
Production Unit/Heater Treater	-Dump Valve	N/A	N/A	N/A	N/A
Well Head	-Valve -Stuffing Box	N/A	N/A	N/A	N/A

Discussion:

Name of Area: Barrel Springs

Operator: Snyder Oil Corporation

PART I
GENERAL INFORMATION

8. Containment or diversionary structures or equipment to prevent oil from reaching navigable waters are practicable. (If NO, complete Attachment #2): YES

9. Inspections and Records

A. The required inspections follow written procedures: YES
B. The written procedures and a record of inspection, signed by the appropriate supervisor or inspector, are attached: YES

Discussion: The pumper makes a visual inspection of the production facility on each scheduled visit, checking all valves, lines, process and storage equipment for leaks or tampering.

10. Personnel, Training, and Spill Prevention Procedures

A. Personnel are properly instructed in the following:

(1) operation and maintenance of equipment to prevent oil discharges: YES
(2) applicable pollution control laws, rules, and regulations: YES
Describe procedures employed for instruction: General spill training is conducted for foreman. Spill cleanup methods are discussed.

B. Scheduled prevention briefings for the operating personnel are conducted frequently enough to assure adequate understanding of the SPCC Plan:

Describe briefing program: Briefings are conducted during regularly scheduled safety meetings.

Response and reporting requirements are discussed.

Name of Area: Barrel Springs

Operator: Snyder Oil Corporation

PART II, ALTERNATE B
DESIGN AND OPERATING INFORMATION

. Facility Drainage

1. Drainage from diked storage areas is controlled as follows (include operating description of valves, pumps, ejectors, etc.): Removal of fluids from the diked in areas is accomplished by vacuum truck. Removed fluids are then properly disposed of in accordance with regulatory statutes.

2. The procedure for supervising the drainage of rain water from secondary containment into a storm drain or an open watercourse is as follows (include description of (a) inspection for pollutants, and (b) method of valving security). (A record of inspection and drainage events is to be maintained on a form similar to Attachment #3): Rainwater is left to evaporate or removed as described in Part II, Alternate B, A.1.

3. Field drainage ditches, road ditches, and oil traps, sumps, or skimmers, if such exist, are inspected at regularly scheduled intervals for accumulations of oil. Describe inspection procedures, intervals, and methods employed to remove oil: The pumper makes a visual inspection of all lease equipment during every scheduled visit paying strict attention for signs of vandalism, theft, leaks, and standing fluids within the diked area.

B. Bulk Storage Tanks

1. Describe tank design, materials of construction, and fail-safe engineering features: Bulk storage tanks are steel and constructed in accordance with API Specification 12B, 12D, or 12F, whichever is applicable. Both pressure and vacuum relief devices are installed on each tank.

Name of Area: Barrel Springs

Operator: Snyder Oil Corporation

ONSHORE OIL PRODUCTION FACILITY

2. Describe secondary containment design, construction materials and volume: Secondary containment is provided by a closed dike of sufficient length, width, and height to dimensions to contain the storage volume of the largest tank in the battery plus 2" of rainwater. The dikes are normally constructed with native soils.

3. Describe tank examination methods and procedures: Tanks are routinely inspected by the pumper during normal monthly stock report gaugings, or during the sale of the oil. The examinations consist of a visual inspection of tank integrity, including locks, gaskets, valves, and seals; berm integrity, and production vessels and piping.

C. Facility Transfer Operations

1. Describe scheduled basis for examinations of above-ground valves and pipelines and salt water disposal facilities: All above ground valves associated with the sale or discharge of produced fluids are box car sealed. The condition of the valves and associated pipelines are inspected during any event requiring the breaking of a seal or verifying the seal is unbroken.

2. Describe flowline maintenance program to prevent spill: Aboveground flowlines are placed out of vehicular traffic patterns. Buried flowlines are either coated and wrapped steel or fiberglass pipe. Fiberglass pipe is the preferred flowline due to its corrosion resistance. Buried pipe pathways are examined during normal location visits for evidence of oil seeps. Flowlines are replaced if a leak develops.

D. Oil Drilling and Workover Facilities.

1. A blowout preventer (BOP) assembly and well control system is installed before drilling below any casing string and, as required during workover operations: YES
2. The BOP assembly is capable of controlling any expected wellhead pressure: YES
3. Casing and BOP installations conform to state regulations: YES

Name of Area: Barrel Springs

Operator: Snyder Oil Corporation

ANNUAL EQUIPMENT INSPECTION REPORT

(CONDITION)	Bad	Fair	Good	Location in Need of Repair
STORAGE TANKS				
STORAGE TANK DIKES				
STORAGE TANK FOUNDATIONS				
PIPE SUPPORTS (IF ANY)				
FWKO TANKS				
PRODUCTION UNIT				
HEATER/TREATERS				
WELL HEAD CONNECTIONS				
POLISH ROD STUFFING BOX				
DUMP VALVES				
SAFETY SHUT DOWN EQUIPMENT				
ABOVE-GROUND CONNECTIONS				

	DATE REPAIRED	DATE REPLACED	FEET REPLACED
FLOW LINES			
POWER OIL LINES:			

COMMENTS:

Name of Area: Barrel Springs

DATE OF INSPECTION:

INSPECTED BY:

SPCC PLAN, ATTACHMENT #1
SPILL HISTORY

(Complete this form for any reportable spill(s) which has (have) occurred from this facility during the twelve months prior to January 10, 1974 into ________________________________ navigable water.)

Date:

Volume:

Cause:

Corrective action taken:

Plans for preventing recurrence:

Name of Area: Barrel Spring

Operator: Snyder Oil Corporation

SPCC PLAN, ATTACHMENT #2
ONSHORE FACILITY BULK STORAGE TANKS
DRAINAGE SYSTEM

Inspection Procedure:

Record of drainage, bypassing, inspection, and oil removal from secondary containment:

Date of Drainage	Date of Bypassing		Date of Inspection	Oil Removal	Supervisor's or Inspector's Signature
	Open	Closed			

Name of Area: Barrel Springs

Operator: Snyder Oil Corporation

SPCC PLAN, ATTACHMENT #3
WELL LISTING

7/31/91 BARREL SPRINGS AREA

PROPERTY NAME	ST	COUNTY	FIELD	QTR/QTR	SEC.	TWP	RGE
CHORNEY FED #1B-12-17-92	WY	CARBON	BALDY BUTTE	NWNW	12	17N	92W
HUSKY FED #1C-18-17-92	WY	CARBON	BLUE GAP	SWSW	18	17N	92W
BSU #30-1-16-93	WY	CARBON	BARREL SPRINGS	SWSW	01	16N	93W
DUCK LAKE UNIT #40-1-16-93	WY	CARBON	BARREL SPRINGS	NWSE	01	16N	93W
BSU #30-2-16-93	WY	CARBON	BARREL SPRINGS	NWSW	02	16N	93W
BSU #40-2-16-93	WY	CARBON	BARREL SPRINGS	NESW	02	16N	93W
BSU #04-1	WY	CARBON	BARREL SPRINGS	CSE	04	16N	93W
BSU #01-6-1A	WY	CARBON	BARREL SPRINGS	CNW	06	16N	93W
BSU #20-6-16-93	WY	CARBON	BARREL SPRINGS	SENE	06	16N	93W
BSU #40-6-16-93	WY	CARBON	BARREL SPRINGS	SESE	06	16N	93W
#07-1	WY	CARBON	BARREL SPRINGS	CSE	07	16N	93W
#08-1	WY	CARBON	BARREL SPRINGS	CNW	08	16N	93W
#40-8-16-93	WY	CARBON	BARREL SPRINGS	NWSE	08	16N	93W
#09-1	WY	CARBON	BARREL SPRINGS	CSE	09	16N	93W
BSU #10-1	WY	CARBON	BARREL SPRINGS	NWNE	10	16N	93W
BSU #10-10-16-93	WY	CARBON	BARREL SPRINGS	SENW	10	16N	93W
BSU #40-10-16-93	WY	CARBON	BARREL SPRINGS	SESE	10	16N	93W
BSU #10-11-16-93	WY	CARBON	BARREL SPRINGS	NWNW	11	16N	93W
BSU #11-1	WY	CARBON	BARREL SPRINGS	SWNE	11	16N	93W
BSU #11-2	WY	CARBON	BARREL SPRINGS	SESW	11	16N	93W
BSU #11-3	WY	CARBON	BARREL SPRINGS	NENE	11	16N	93W
BSU #13-1	WY	CARBON	BARREL SPRINGS	NWNW	13	16N	93W
BSU #13-2 (WSW)	WY	CARBON	BARREL SPRINGS	SENW	13	16N	93W
BSU #14-1	WY	CARBON	BARREL SPRINGS	SWSE	14	16N	93W
BSU #14-2	WY	CARBON	BARREL SPRINGS	SENW	14	16N	93W
BSU FEDERAL #J-1 TA	WY	CARBON	BARREL SPRINGS	NWNW	14	16N	93W
BSU #01 (CLARK)	WY	CARBON	BARREL SPRINGS	NWNE	15	16N	93W
BSU #10-15-16-93	WY	CARBON	BARREL SPRINGS	SWNW	15	16N	93W
BSU #15-1	WY	CARBON	BARREL SPRINGS	NESW	15	16N	93W
BSU #16-1	WY	CARBON	BARREL SPRINGS	SWSE	16	16N	93W

PROPERTY NAME	ST	COUNTY	FIELD	QTR/QTR	SEC.	TWP	RGE
BSU #10-17-16-93	WY	CARBON	BARREL SPRINGS	CNW	17	16N	93W
BSU #17-1	WY	CARBON	BARREL SPRINGS	SWSW	17	16N	93W
BSU #10-18-16-93	WY	CARBON	BARREL SPRINGS	SWNW	18	16N	93W
BSU #18-1	WY	CARBON	BARREL SPRINGS	CSE	18	16N	93W
BSU #40-19-16-93	WY	CARBON	BARREL SPRINGS	SWSE	19	16N	93W
BSU #10-20-16-93	WY	CARBON	BARREL SPRINGS	SWNW	20	16N	93W
BSU #05-1	WY	CARBON	BARREL SPRINGS	NWNE	22	16N	93W
BSU #23-1	WY	CARBON	BARREL SPRINGS	SWSE	23	16N	93W
BSU #24-1	WY	CARBON	BARREL SPRINGS	NWNW	24	16N	93W
BSU #25-1	WY	CARBON	BARREL SPRINGS	NESE	25	16N	93W
BSU #27-1 TA	WY	CARBON	BARREL SPRINGS	NESE	27	16N	93W
BSU #10-29-16-93	WY	CARBON	BARREL SPRINGS	SWNE	29	16N	93W
BSU #29-2	WY	CARBON	BARREL SPRINGS	CSE	29	16N	93W
BSU #10-32-16-93	WY	CARBON	BARREL SPRINGS	SENW	32	16N	93W
CIGE PET CORP #1C-24-17-93*	WY	CARBON	STANDARD DRAW	CSW	24	17N	93W
FEDERAL (HIGHPOINT) #1-26-17-93	WY	CARBON	STANDARD DRAW	SWNE	26	17N	93W
CIGE FED #1C-30-17-93	WY	CARBON	BLUE GAP	CSW	30	17N	93W
BSU #36-1-17-93	WY	CARBON	BARREL SPRINGS	SW	36	17N	93W
CIGE PET CORP #1C-8-18-93	WY	CARBON	STANDARD DRAW	CSW	18	18N	93W
FEDERAL (HIGHPOINT) 1C-20-18-93	WY	CARBON	STANDARD DRAW	NESW	20	18N	93W
E PET CORP #1C-24-18-93	WY	CARBON	WILDROSE?	NWSW	24	18N	93W
E PET CORP #1C-26-18-93	WY	CARBON	STANDARD DRAW	NWSW	26	18N	93W
CIGE PET CORP #1C-32-18-93	WY	CARBON	STANDARD DRAW	CSW	32	18N	93W
BSU #12-1	WY	SWEETWATER	BARREL SPRINGS	CNW	12	16N	94W

SPCC PLAN, ATTACHMENT #4
WELL LOCATION

All wells in attachment #3 have been plotted on a Quadrangle, 7.5 minute series, topographic map.

APPENDIX C:
PLANT SPECIES LIST

Plant Species List

Common Name	Scientific Name
Trees	
Box elder	*Acer negundo*
Water birch	*Betula occidentalis*
Dogwood	*Cornus* spp.
Cottonwood	*Populus deltoides*
Shrubs	
Alkali sagebrush	*Artemisia longiloba*
Black sagebrush	*Artemisia nova*
Birdsfoot sage	*Artemisia pedatifida*
Bud sage	*Artemisia spinescens*
Big sagebrush	*Artemisia tridentata*
Four-wing saltbush	*Atriplex canescens*
Shadscale saltbush	*Atriplex convertifolia*
Gardner's saltbush	*Atriplex gardneri*
Mountain mahogany	*Cercocarpus montanus*
Low rabbitbrush	*Chrysothamnus humilis*
Rubber rabbitbrush	*Chrysothamnus nauseosus*
Spiney hopsage	*Grayia spinosa*
Juniper	*Juniperus* spp.
Kochia	*Kochia americana*
Winterfat	*Krascheninnikovia lanata*
Desert parsley	*Lomatium foeniculaceum*
Antelope bitterbrush	*Purshia tridentata*
Skunkbush	*Rhus trilobata*
Rose	*Rosa* spp.
Willow	*Salix* spp.
Greasewood	*Sarcobatus vermiculatus*
Western hopsage	*Zuckia brandegei*

Plant Species List (Continued)

Common Name	Scientific Name
Grasses and Grass-like Species	
Crested wheatgrass	*Agropyron cristatum*
Northern reedgrass	*Calamagrostis inexpansa*
Nebraska sedge	*Carex nebraskensis*
Tufted hairgrass	*Deschampsia caespitosa*
Basin wildrye	*Elymus cinereus*
Bottlebrush squirreltail	*Elymus elymoides*
Russian wildrye	*Elymus junceus*
Thickspike wheatgrass	*Elymus lanceolatus*
Streambank wheatgrass	*Elymus riparius*
Western wheatgrass	*Elymus smithii*
Bluebunch wheatgrass	*Elymus spicatus*
Slender wheatgrass	*Elymus trachycaulus*
Contracted Indian ricegrass	*Oryzopsis contracta*
Indian ricegrass	*Oryzopsis hymenoides*
Canby bluegrass	*Poa canbii*
Sandberg bluegrass	*Poa sandbergii*
Alkali sacaton	*Sporobolus airoides*
Sand dropseed	*Sporobolus cryptandrus*
Needle-and-thread	*Stipa comata*
Letterman needlegrass	*Stipa lettermanii*
Forbs	
Western yarrow	*Achillea millefolium*
Prairie onion	*Allium textile*
Onion	*Allium* spp.
Pussytoes	*Antennaria* spp.
Eastwood sandwort	*Arenaria eastwoodiae*
Fringed sage	*Artemisia frigida*
Aster	*Aster* spp.
Woody aster	*Aster xylorrhiza*

Plant Species List (Continued)

Common Name	Scientific Name
Forbs (Continued)	
Milkvetch	*Astragalus* spp.
Broad-flowered pincushion	*Chaenactis stevioides*
Water hemlock	*Cicuta* spp.
Onion springparsley	*Cymopterus bulbosus*
Fleabane	*Erigeron consimilis*
Englemann daisy	*Erigeron englemanni*
Fleabane	*Erigeron* spp.
Wild buckwheat	*Erigonum* spp.
Plains wallflower	*Erysimum asperum*
Horsetail	*Equisetum* spp.
Colorado bedstraw	*Galium coloradoense*
American licorice	*Glycyrrhiza lepidota*
Goldenweed	*Haplopappus* spp.
Povertyweed	*Iva* spp.
Kochia	*Kochia americana*
Lewis flax	*Linum lewisii*
Eveningprimrose	*Oenothera* spp.
Elephanthead	*Pedicularis* spp.
Gibben's beardtongue	*Penstemon gibbensii*
Sheep creek beardtongue	*Penstemon mucronatus*
Penstemon	*Penstemon* spp.
Phacelia	*Phacelia* spp.
Hood's phlox	*Phlox hoodii*
Phlox	*Phlox* spp.
Primrose	*Primula* spp.
Dock	*Rumex* spp.
Stonecrop	*Sedum* spp.
Groundsel	*Senecio spartioides*
Blue-eyed grass	*Sisyrinchium* spp.

Plant Species List (Continued)

Common Name	Scientific Name
Forbs (Continued)	
Scarlet globemallow	*Sphaeralcea coccinia*
Goldenpea	*Thermopsis* spp.
Clover	*Trifolium* spp.
Arrowgrass	*Triglochin* spp.

APPENDIX D:

ANIMAL SPECIES LIST

Animal Species Known to Occur or Potentially Occurring Within the CBGA, Carbon and Sweetwater Counties, Wyoming, 1994[1]

Common Name	Scientific Name
MAMMALS[2]	
Masked Shrew	*Sorex cinereus*
Merriam's Shrew	*S. merriami*
Dusky Shrew	*S. monticolus*
Dwarf Shrew	*S. nanus*
Water Shrew	*S. palustris*
Western Small-footed Myotis	*Myotis ciliolabrum*
Long-eared Myotis	*M. evotis*
Little Brown Myotis	*M. lucifugus*
Long-legged Myotis	*M. volans*
Red Bat	*Lasiurus borealis*
Hoary Bat	*L. cinereus*
Silver-haired Bat	*Lasionycteris noctivagans*
Big Brown Bat	*Eptesicus fuscus*
Townsend's Big-eared Bat	*Plecotus townsendii*
Desert Cottontail	*Sylvilagus audubonii*
Mountain (Nuttall's) Cottontail	*S. nuttallii*
Snowshoe Hare	*Lepus americanus*
White-tailed Jackrabbit	*L. townsendii*
Least Chipmunk	*Tamias minimus*
Yellow-bellied Marmot	*Marmota flaviventris*
Wyoming Ground Squirrel	*Spermophilus elegans*
Golden-mantled Ground Squirrel	*S. lateralis*
Thirteen-lined Ground Squirrel	*S. tridecemlineatus*
White-tailed Prairie Dog	*Cynomys leucurus*
Wyoming Pocket Gopher	*Thomomys clusius*
Northern Pocket Gopher	*T. talpoides*

Animal Species List (Continued)

Common Name	Scientific Name
Olive-backed Pocket Mouse	*Perognathus fasciatus*
Silky Pocket Mouse	*P. flavus*
Ord's Kangaroo Rat	*Dipodomys ordii*
Beaver	*Castor canadensis*
Deer Mouse	*Peromyscus maniculatus*
Northern Grasshopper Mouse	*Onychomys leucogaster*
Bushy-tailed Woodrat	*Neotoma cinerea*
Montane Vole	*Microtus montanus*
Sagebrush Vole	*Lemmiscus curtatus*
Muskrat	*Ondatra zibethicus*
Western Jumping Mouse	*Zapus princeps*
Porcupine	*Erethizon dorsatum*
Coyote	*Canis latrans*
Red Fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*
Long-tailed Weasel	*Mustela frenata*
Black-footed Ferret	*M. nigripes*
Mink	*M. vison*
Badger	*Taxidea taxus*
Western Spotted Skunk	*Spilogale gracilis*
Striped Skunk	*Mephitis mephitis*
Mountain Lion	*Felis concolor*
Bobcat	*F. rufus*
Elk	*Cervus elaphus*
Mule Deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*

Animal Species List (Continued)

Common Name	Scientific Name
BIRDS[3]	
Pied-billed Grebe	*Podilymbus podiceps*
Eared Grebe	*Podiceps nigricollis*
Western Grebe	*Aechmophorus occidentalis*
American White Pelican	*Pelecanus erythrorhynchos*
Great Blue Heron	*Ardea herodias*
Snowy Egret	*Egretta thula*
Cattle Egret	*Bubulcus ibis*
Black-crowned Night-Heron	*Nycticorax nycticorax*
White-faced Ibis	*Plegadis chihi*
Canada Goose	*Branta canadensis*
Green-winged Teal	*Anas crecca*
Mallard	*A. platyrhynchos*
Northern Pintail	*A. acuta*
Blue-winged Teal	*A. discors*
Cinnamon Teal	*A. cyanoptera*
Northern Shoveler	*A. clypeata*
Gadwall	*A. strepera*
American Wigeon	*A. americana*
Canvasback	*Aythya valisineria*
Redhead	*A. americana*
Ring-necked Duck	*A. collaris*
Lesser Scaup	*A. affinis*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*B. islandica*
Bufflehead	*B. albeola*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*M. serrator*

Animal Species List (Continued)

Common Name	Scientific Name
Ruddy Duck	*Oxyura jamaicensis*
Turkey Vulture	*Cathartes aura*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*A. cooperii*
Northern Goshawk	*A. gentilis*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*B. jamaicensis*
Ferruginous Hawk	*B. regalis*
Rough-legged Hawk	*B. lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*F. columbarius*
Peregrine Falcon	*F. peregrinus*
Prairie Falcon	*F. mexicanus*
Sage Grouse	*Centrocercus urophasianus*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Sandhill Crane	*Grus canadensis*
Black-bellied Plover	*Pluvialis squatarola*
Snowy Plover	*Charadrius alexandrinus*
Semipalmated Plover	*C. semipalmatus*
Killdeer	*C. vociferus*
Mountain Plover	*C. montanus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*

Animal Species List (Continued)

Common Name	Scientific Name
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*T. flavipes*
Solitary Sandpiper	*T. solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitus macularia*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*C. pusilla*
Western Sandpiper	*C. mauri*
Least Sandpiper	*C. minutilla*
Baird's Sandpiper	*C. bairdii*
Pectoral Sandpiper	*C. melanotos*
Stilt Sandpiper	*C. himantopus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*P. lobatus*
Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*L. philadelphia*
Ring-billed Gull	*L. delawarensis*
California Gull	*L. californicus*
Forster's Tern	*Sterna forsteri*
Black Tern	*Chlidonias niger*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Black-billed Cuckoo	*Coccyzus erythropthalmus*

Animal Species List (Continued)

Common Name	Scientific Name
Great Horned Owl	*Bubo virginianus*
Burrowing Owl	*Athene cunicularia*
Long-eared Owl	*Asio otus*
Short-eared Owl	*A. flammeus*
Common Nighthawk	*Chordeiles minor*
Common Poorwill	*Phalaenoptilus nuttallii*
White-throated Swift	*Aeronautes saxatalis*
Broad-tailed Hummingbird	*Selasphorus platycercus*
Rufous Hummingbird	*S. rufus*
Belted Kingfisher	*Ceryle alcyon*
Lewis' Woodpecker	*Melanerpes lewis*
Red-headed Woodpecker	*M. erythrocephalus*
Red-naped Sapsucker	*Sphyrapicus nuchalis*
Williamson's Sapsucker	*S. thyroideus*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*P. villosus*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus borealis*
Western Wood-Pewee	*C. sordidulus*
Willow Flycatcher	*Empidonax traillii*
Least Flycatcher	*E. minimus*
Dusky Flycatcher	*E. oberholseri*
Gray Flycatcher	*E. wrightii*
Cordilleran Flycatcher	*E. occidentalis*
Say's Phoebe	*Sayornis saya*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*T. tyrannus*

Animal Species List (Continued)

Common Name	Scientific Name
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Violet-green Swallow	*T. thalassina*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Hirundo pyrrhonota*
Barn Swallow	*H. rustica*
Steller's Jay	*Cyanocitta stelleri*
Blue Jay	*C. cristata*
Scrub Jay	*Aphelocoma coerulescens*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Clark's Nutcracker	*Nucifraga columbiana*
Black-billed Magpie	*Pica pica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*C. corax*
Black-capped Chickadee	*Parus atricapillus*
Mountain Chickadee	*P. gambeli*
Plain Titmouse	*P. inornatus*
Red-breasted Nuthatch	*Sitta canadensis*
White-breasted Nuthatch	*S. carolinensis*
Brown Creeper	*Certhia americana*
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Marsh Wren	*Cistothorus palustris*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*

Animal Species List (Continued)

Common Name	Scientific Name
Mountain Bluebird	*Sialia currucoides*
Veery	*Catharus fuscescens*
Swainson's Thrush	*C. ustulatus*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Sage Thrasher	*Oreoscoptes montanus*
Bohemian Waxwing	*Bombycilla garrulus*
Cedar Waxwing	*B. cedrorum*
Northern Shrike	*Lanius excubitor*
Loggerhead Shrike	*L. ludovicianus*
European Starling	*Sturnus vulgaris*
Solitary Vireo	*Vireo solitarius*
Warbling Vireo	*V. gilvus*
Red-eyed Vireo	*V. olivaceus*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*V. celata*
Virginia's Warbler	*V. virginiae*
Yellow Warbler	*Dendroica petechia*
Yellow-rumped Warbler	*D. coronata*
Black-throated Gray Warbler	*D. nigrescens*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*S. noveboracensis*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Wilson's Warbler	*Wilsonia pusilla*

Animal Species List (Continued)

Common Name	Scientific Name
Yellow-breasted Chat	*Icteria virens*
Western Tanager	*Piranga ludoviciana*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
Lazuli Bunting	*Passerina amoena*
Indigo Bunting	*P. cyanea*
Green-tailed Towhee	*Pipilo chlorurus*
Rufous-sided Towhee	*P. erythrophthalmus*
American Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*S. passerina*
Brewer's Sparrow	*S. breweri*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Sage Sparrow	*Amphispiza belli*
Lark Bunting	*Calamospiza melanocorys*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*M. lincolnii*
White-crowned Sparrow	*Zonotrichia leucophrys*
Dark-eyed Junco	*Junco hyemalis*
McCown's Longspur	*Calcarius mccownii*
Lapland Longspur	*C. lapponicus*
Chestnut-collared Longspur	*C. ornatus*
Snow Bunting	*Plectrophenax nivalis*
Bobolink	*Dolichonyx oryzivorus*
Red-winged Blackbird	*Agelaius phoeniceus*

Animal Species List (Continued)

Common Name	Scientific Name
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Northern Oriole	*Icterus galbula*
Scott's Oriole	*I. parisorum*
Rosy Finch	*Leucosticte arctoa*
Cassin's Finch	*Carpodacus cassinii*
House Finch	*C. mexicanus*
Red Crossbill	*Loxia curvirostra*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*C. tristis*
Evening Grosbeak	*Coccothraustes vespertinus*
House Sparrow	*Passer domesticus*
AMPHIBIANS AND REPTILES[4]	
Tiger Salamander	*Ambystoma tigrinum*
Great Basin Spadefoot	*Scaphiopus intermontanus*
Boreal Toad	*Bufo boreas*
Chorus Frog	*Pseudacris triseriata*
Leopard Frog	*Rana pipiens*
Sagebrush Lizard	*Sceloporus graciosus*
Short-horned Lizard	*Phrynosoma douglassi*
Smooth Green Snake	*Opheodrys vernalis*
Great Basin Gopher Snake	*Pituophis melanoleucas deserticola*
Western Terrestrial Garter Snake	*Thamnophis elegans*
Prairie Rattlesnake	*Crotalus viridis*

Animal Species List (Continued)

Common Name	Scientific Name
FISH[5]	
Mountain Whitefish	*Prosopium williamsoni*
Cutthroat Trout (Colorado River subspecies)	*Oncorhynchus clarki*
Rainbow Trout	*O. mykiss*
Brook Trout	*Salvelinus fontinalis*
Northern Pike	*Esox lucius*
Common Carp	*Cyprinus carpio*
Creek Chub	*Semotilus atromaculatus*
Roundtail Chub	*Gila robusta*
Redside Shiner	*Richardsonius balteatus*
Colorado Squawfish	*Ptychocheilus lucius*
Speckled Dace	*Rhinichthys osculus*
White Sucker	*Catostomus commersoni*
Flannelmouth Sucker	*C. latipinnis*
Mountain Sucker	*C. platyrhynchus*
Bluehead Sucker	*C. discobolus*
Channel Catfish	*Ictalurus punctatus*
Walleye	*Stizostedion vitreum*
Mottled Sculpin	*Cottus bairdi*

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[1] Based on range and habitat characteristics.
[2] Adapted from Clark and Stromberg (1987) and WGFD (1992).
[3] Adapted from Scott (1987), Russell (1990), and WGFD (1992).
[4] Adapted from Stebbins (1966), Baxter and Stone (1980), and Smith and Brodie (1982).
[5] Adapted from Baxter and Simon (1970) and American Fisheries Society (1991).

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